DRAFT
REMEDIAL INVESTIGATION
FOR THE STANDARD CHLORINE CHEMICAL COMPANY INC.
AND
STANDARD NAPHTHALENE PRODUCTS INC.
PROPERTIES, KEARNY, NEW JERSEY

Prepared for

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1035 Belleville Turnpike
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May 1993

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF APPENDICES

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

SECTION 1
INTRODUCTION

This report outlines the activities completed for the Remedial Investigation (RI) at the Standard Chlorine Chemical Company Inc. (SCCC) and the Standard Naphthalene Products Inc. (SNP) properties that cover 25 acres located at 1015-1035 Belleville Turnpike, Kearny, Hudson County. A naphthalene refining operation occupied the eastern two-thirds of the site from 1916 to 1962 when that portion of the property was purchased by SNP and used to process refined petroleum naphthalene into finished products. SCCC separated and stored trichlorobenzene on the property from 1970 to 1980. SNP ceased operations on the site in 1981.

SCCC purchased the remaining one-third of the property in 1962 and used it to refine, blend and store dichlorobenzene products. SCCC ceased the refining of dichlorobenzenes in 1982 and ceased the storage and use of dichlorobenzenes in 1987.

Currently, the site has no manufacturing operations and present activities are limited to an administrative office building on the western end of the site.

Between 1983 and 1987, several areas of concern were identified by the New Jersey Department of Environmental Protection and Energy (NJDEPE). Sampling subsequently completed by SCCC confirmed three areas of contamination:

- Hexavalent chromium was found in fill material which was used extensively in the past to backfill marshlands in this area. Approximately 85% of the SCCC site is covered with between 2 to 10 feet of this material. The material is a granular chromium waste thought to originate from the former Diamond Shamrock facility adjacent to the site.

- Volatile and semivolatile hydrocarbon compounds were found in shallow groundwater beneath the site and in soil samples.

- Dioxin compound 2,4,7,8-TCDD was found in materials in waste lagoons associated with the naphthalene refinery process adjacent to the former process building. A wipe sample in the distillation vat also contained 2,4,7,8-TCDD. The lagoons were used to dispose of still bottoms from the naphthalene manufacturing process.

On 20 October 1989, an Administrative Consent Order (ACO) was entered into between NJDEPE and SCCC. The ACO required that SCCC plan and implement:

- Interim remedial measures to prevent potential contact with contaminants in the lagoon area, to prevent potential overflow of the lagoon, and to secure damaged tanks/containers.

- A remedial investigation, which includes a characterization of wastes and contaminated materials which may be the source of air, soil, surface water, and groundwater pollution at the site.

- Feasibility study to identify and evaluate potentially viable remedial action alternatives for contaminants at the site, and recommend an alternative.

- The selected remedial action alternative.

The results of previous investigations provided data on contaminants in soils and groundwater across the site. Limited investigation of potential source areas was also conducted, including the lagoons and buildings in the former manufacturing area. Other potential source areas were identified during the RI, including the septic system and

former chemical off-loading areas. The overall objectives of the Remedial Investigation were to complete the characterization of the site contamination and identify potential receptors of offsite migration. This information will be used to develop the analysis of remedial alternatives in the feasibility study. The areas investigated during the remedial investigation included:

- Groundwater in the fill and unconsolidated sands directly underlying the site.
- Stratified waste material in the lagoon.
- Surfaces in the distillation building.
- Soils in the tank storage areas and tank contents.
- Surface water and sediments in the drainage swale.
- Chromium slag fill.

1.1 PURPOSE

The purpose of this report is to summarize the results of the Interim Remedial Measures (IRM) and RI completed to date. The recent RI investigation was completed in two phases. Phase I was completed as described and approved by NJDEPE in the RI Work Plan (WESTON, 1990) from December 1991 to January 1992. The results of Phase I were briefly summarized in a Supplemental Work Plan (WESTON, 1992) that outlined additional work required to complete the site characterization. This Supplemental Work Plan was approved by DEPE in September 1992. Phase II of the RI was completed from September to October 1992. The site characterization presented in this RI report includes

the results of the two RI phases along with information obtained in previous investigations completed at the SCCC Kearny facility.

1.2 SITE BACKGROUND

1.2.1 Site Description

The SCCC site consists of approximately 25 acres bounded by the Hackensack River to the east; Belleville Turnpike to the west; by property to the north formerly owned by Diamond Shamrock Corporation and currently owned by Maxus Energy; and by the Koppers Company, Inc. (Koppers) property to the south (see Figure 1-1). The site currently has two owners. SCCC owns Block 287, Lot 50; and SNP owns Block 287, Lots 48, 49, 51, 52, and 52R. The SCCC property was owned by the Edison Company from 1918 to approximately 1947 and by Crown Rubber Products, Inc. from approximately 1947 to 1959. Keaton Rubber Company owned the property from 1959 to 1962 when it was sold to SCCC. SNP purchased their property from Koppers in 1962. The White Tar Company owned Lots 48 and 49 from 1916 until Koppers purchased White Tar in 1942. Lots 51, 52, and 52R had been owned by Thomas A. Edison, Inc. from 1917/1918 to 1946, when they were sold to Koppers.

1.2.2 Site History

White Tar refined crude naphthalene at the site until 1942. Thereafter, Koppers took over operations at the site where it continued similar activities manufacturing naphthalene products and creosote disinfectants. In the course of its manufacturing operations, Koppers processed approximately 11,000 tons of crude coal tar naphthalene and naphthalene oil each year. The crude naphthalene, which was a solid, was imported and stored in burlap bags. Additional raw materials in the naphthalene refining process included caustic soda and sulfuric acid. Raw materials used in the production of disinfectants included resin, castor oil, petroleum tar acids, pine tar oil, linseed oil, tar

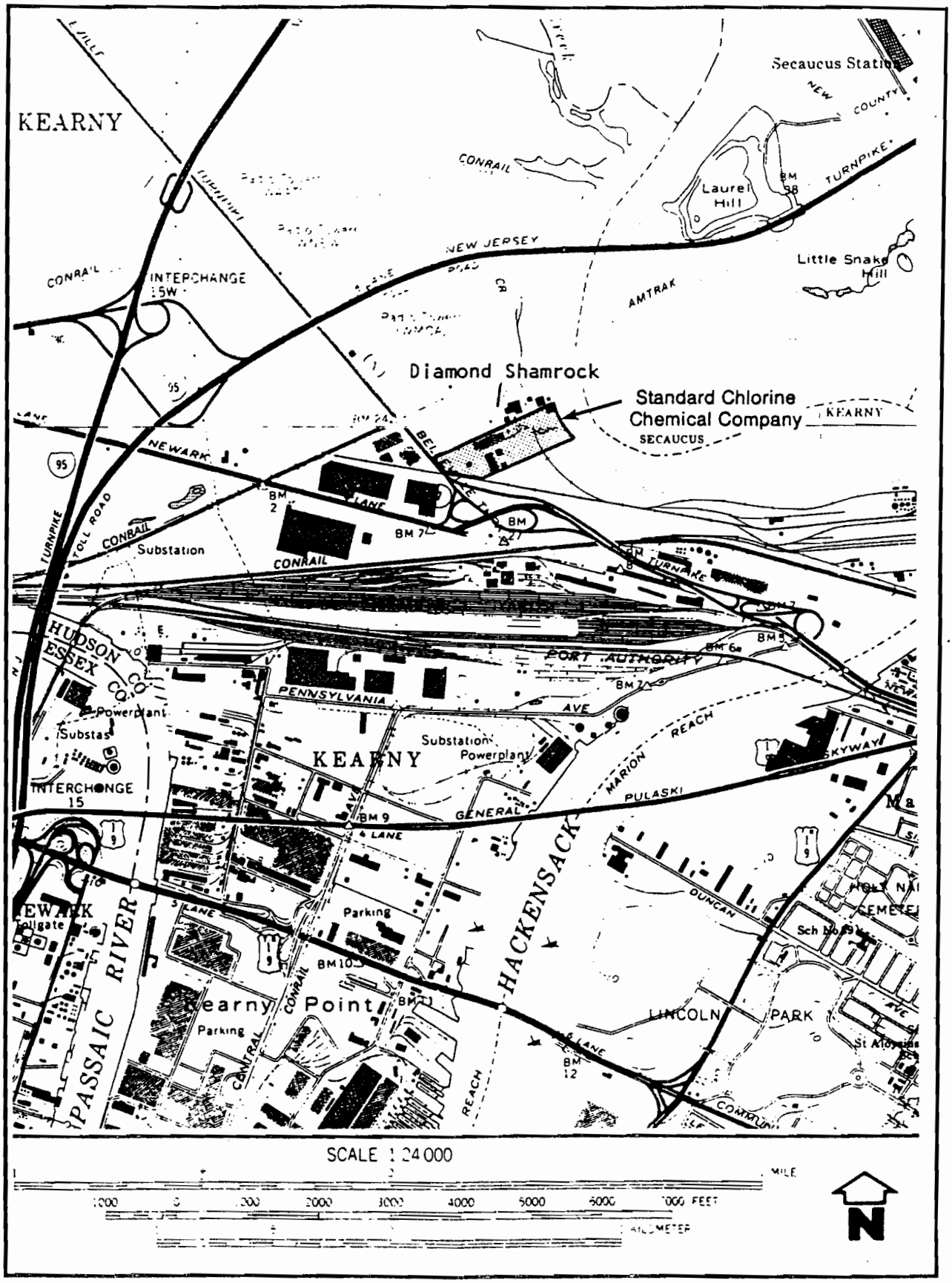

FIGURE 1-1 SITE LOCATION - STANDARD CHLORINE CHEMICAL COMPANY, KEARNY, NJ

acid oil, coal tar acids, steam distilled pine oil, caustic soda, kerosene, neutral oil, caustic potash, ligrow and solvent oil. In addition to the refined naphthalene and disinfectants, Koppers also stored and packaged paradichlorobenzene moth preventatives and deodorizers in solid form at the site. The naphthalene refining process included a washing operation by which coal tar acids, coal tar bases, and coal tar oils were removed from the crude naphthalene.

Waste residues were discharged from the process building to the adjacent "lagoons" which consist of an excavated area of approximately 33,000 sq. ft. In addition, Koppers discharged boiler blowdown to the septic system.

Diamond Shamrock operated a chromium processing facility north of the site. Operations by Diamond Shamrock at this facility were discontinued during the 1970s. The site has been paved as an interim measure and is currently used for Remedial Operation Administration offices in temporary structures.

SNPs operations at the site between 1963 and 1981 included the manufacturing of moth balls, crystals, and flakes from refined naphthalene. SNP never engaged in the refining of crude naphthalene or naphthalene oil at the site.

SCCC's operations at the site included the manufacturing of moth crystals and flakes from dichlorobenzene. SCCC separated dichlorobenzene isomers at the site from 1963 until 1971. Raw materials were transported to the site by rail and tank truck for processing. SCCC also separated and stored 1,2,4-trichlorobenzene at the site from 1970 to 1980. An SCCC subsidiary, the Cloroben Chemical Corporation (Cloroben) operated a small batch formulation and blending operation at the site for various drain cleaners known as "Cloroben." From 1963 until 1987, some Cloroben products were formulated at the site from orthodichlorobenzene. Cloroben production at the site included the use of methylbenzoate, terpene solvents, hydrochloric acid and sulfuric acid which was restricted to Building 4, with bottling and packaging done in Building 3. Other buildings

at the site are used for office and warehouse purposes. The laboratory was in Building 2. Cloroben operations ended 1 May 1993.

1.2.2.1 Storage and Disposal Practices

In a Selected Substance Report dated October 1983, SCCC reported that orthodichlorobenzene was produced at the plant from 1963 to November 1981. Purchased mixed dichlorobenzene isomers were separated by continuous fractional crystallization and the separated isomers were stored on-site for later sale. Annual production averaged 2,500,000 pounds of technical grade orthodichlorobenzene. The report states that no waste products were generated. Between 1981 and 1987, the orthodichlorobenzene was brought to the site in tank trucks and blended with an emulsifier in dedicated tanks to produce Cloroben.

According to the October 1983 Selected Substances Report, 1,2,4-trichlorobenzene was produced by fractional distillation between 1970 and 1980 and stored on-site until it was sold. An estimated 1,500,000 pounds of technical trichlorobenzene were produced each year. Solid waste produced in this process was allegedly disposed of in the on-site lagoons until July 1979 at an average rate of 12,000 pounds per year. SCCC also estimated that 1,500 pounds per year of 1,2,4-trichlorobenzene were released in air emissions and 5,000 pounds per year were released in wastewater discharge.

Currently, the majority of wastes from the site is transported for off-site disposal. Wastewater from a septic system discharges on-site and is regulated by an NJPDES permit as discussed in the following section.

1.2.2.2 Permits

Under NJPDES Discharge to Surface Water (DSW) Permit No. NJD0001856, SCCC is permitted discharge septic tank overflow boiler blowdown and stormwater runoff into a

drainage ditch located in the southwest portion of the site. This permit, which became effective on 1 February 1986 and expired on 31 January 1991, granted permission to discharge to the Hackensack River in accordance with effluent limitations and monthly monitoring requirements. A permit application for stormwater was filed in May 1993. The ECRA GIS was filed with NJDEPE in May 1993.

1.3 PREVIOUS REPORTS AND INVESTIGATIONS

1.3.1 NJDEPE Site Inspection (1982)

NJDEPE inspection of the site on 31 August 1982 revealed that large portions of the site were covered with chromium contaminated fill materials. Yellowish pools of stormwater runoff and yellow precipitate were observed, which suggested the presence of hexavalent chromium. Stormwater runoff adjacent to the facility entrance has at times appeared yellow. Spillages of products identified as naphthalene and dichlorobenzene were also observed on the ground surface at the site in several areas.

NJDEPE inspection of the site on 23 June 1982 disclosed that the lagoon system at the site was reported by SCCC to have been used for waste disposal by the former property owner, Koppers.

NJDEPE also reviewed the analytical results for groundwater samples collected by Diamond Shamrock from a monitor well (MW-9) located on Diamond Shamrock's property adjacent to SCCC's northern boundary. The analysis indicated the presence of naphthalene, dichlorobenzenes, and trichlorobenzenes. These compounds were suspected by NJDEPE to have originated from the SCCC site, since the compounds were processed at the site by one or more of its owners or operators, including SNP, SCCC, Koppers and White Tar.

Based upon the above findings, the Department directed SCCC in a letter dated 28 February 1983 to conduct a hydrogeological investigation to determine the impact of the site on the groundwater.

1.3.2 Hydrogeologic Investigation

A hydrogeologic investigation was conducted by WESTON on behalf of SCCC in July and August 1983. The investigation included monitor well installation, subsurface soil and groundwater sampling and the development of lithologic cross sections and groundwater flow maps. The results of the investigation were presented in a report titled, *Hydrogeologic Investigation, Standard Chlorine Chemical Company, Kearny, New Jersey* (WESTON, January 1984).

1.3.2.1 Soil Sampling

In July 1983, SCCC installed ten 2-inch diameter PVC groundwater monitor wells at the site at five locations, as shown in Figure 1-2. Each location included a cluster of one shallow well (8 to 10 ft deep) and one deep well (18 to 22 ft deep). During the installation of the monitor wells, nineteen soil samples were collected in the fill and natural subsurface materials. The samples were analyzed for metals, primarily EP toxicity (Table 1-1). Five samples were analyzed for volatile organic compounds (VOCs).

Total chromium concentrations were high (exceeding 6000 mg/kg) in the fill in the lagoon and in some areas of the meadow mat. Hexavalent chromium was below the detection limit of 1 mg/L in seven samples except three from the fill. None of the levels exceeded the EP toxicity limits (see Table 1-1).

Soil samples collected at depths between 15 and 17 ft at locations 1, 4, and 5 contained VOCs at concentrations of 178 parts per million (ppm), 5 ppm, 4 ppm, respectively, of total VOCs. The compounds detected included the following substances: ortho-

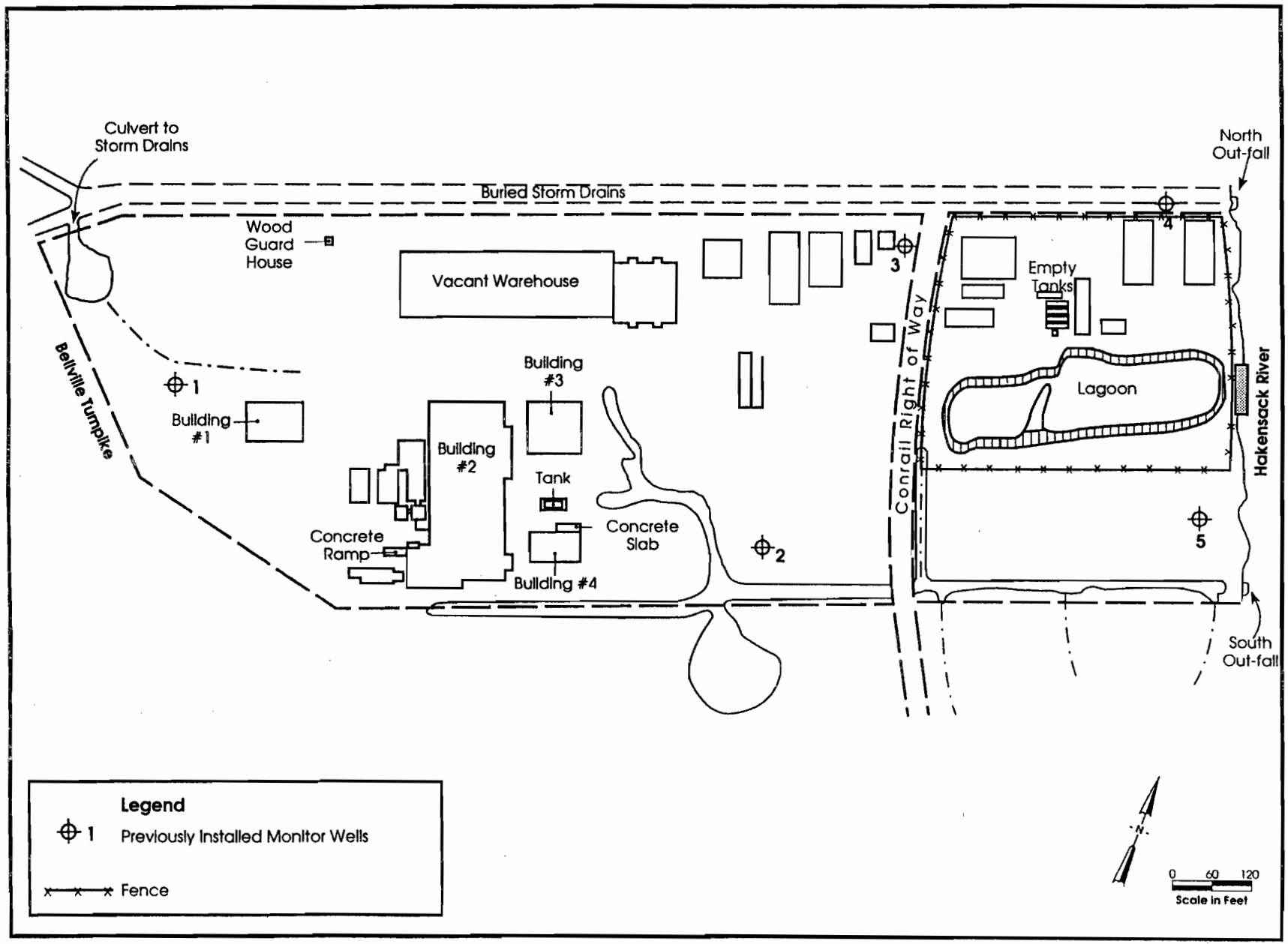

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FIGURE 1-2 MONITOR WELL LOCATIONS STANDARD CHLORINE, KEARNY, NJ

Table 1-1

Summary of Soil Sample Metals Analyses Results
SCCC, Kearny, NJ (1983)

Description	pH	Total Chromium		EP Toxicity Test Leachate							
		Chromium mg/kg	Hexavalent Chromium mg/kg	As mg/l	Ba mg/l	Cd mg/l	Cr mg/l	Pb mg/l	Hg mg/l	Se mg/l	Ag mg/l
1D: 5-7' fill	NA	150	ND	ND	0.81	ND	ND	ND	ND	ND	ND
1D: Meadow mat	7.7	3	ND	ND	0.56	ND	ND	ND	ND	ND	ND
1D: 15-16' sand	NA	6	ND	ND	0.17	ND	ND	ND	ND	ND	ND
2D: 5-7' fill	12.3	31,100	14.4	ND	0.68	ND	16	ND	ND	.018	ND
2D: Meadow mat	11.7	16,500	0.7	ND	0.019	ND	3.23	ND	ND	ND	ND
2D: 13' silt	NA	82	ND	ND	0.34	ND	ND	ND	ND	ND	ND
2D: 13-15' sand	NA	48	ND	ND	0.15	ND	ND	ND	ND	ND	ND
3D: 2-3' fill	12.2	31,000	5.7	ND	0.62	ND	5.44	ND	ND	.017	ND
3D: 5-7' fill	11.4	745	ND	ND	0.51	ND	ND	ND	ND	ND	ND
3D: Meadow mat	8.2	9,900	ND	ND	0.54	ND	0.87	ND	ND	ND	ND
3D: 12-13' sand	NA	10	ND	ND	0.16	ND	ND	ND	ND	ND	ND
4D: Meadow mat	8.1	770	ND	ND	0.46	ND	ND	ND	ND	ND	ND
4D: 15-17' sand	NA	49	ND	ND	0.19	ND	ND	ND	ND	ND	ND
4D: 15-17' sand	5.7	36	ND	ND	0.19	ND	ND	ND	ND	ND	ND
5D: 5-7' fill	12.2	18,000	38.0	ND	0.43	ND	43.6	ND	ND	.013	ND
5D: Meadow mat	8.7	7,600	ND	ND	0.78	ND	3.08	ND	ND	ND	ND
5D: 17-19' sand	NA	12	ND	0.051	0.07	ND	0.41	ND	ND	ND	ND
Lagoon 1	NA	7,700	ND	ND	0.30	ND	0.41	ND	ND	ND	ND
Lagoon 2	NA	6,400	ND	ND	0.11	ND	ND	ND	ND	ND	ND

ND = Not Detected
NA = Not Analyzed

dichlorobenzene, meta-dichlorobenzene, paradichlorobenzene, trichloroethylene, tetrachloroethylene, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, and naphthalene. The chlorobenzene and naphthalene compounds were related to known past site activities. Neither SNP nor SCCC produced or used chlorinated solvents trichloroethylene or tetrachloroethylene in any of their processes.

1.3.2.2 Groundwater Sampling

On 4 August 1983, SCCC collected groundwater samples from the ten monitor wells at the site. The results of the analyses of these samples, summarized in Table 1-2, revealed the following organic compounds in groundwater: benzene, chlorobenzene, dichlorobenzenes, tetrachloroethylene, trichloroethylene, toluene, and naphthalene. Neither SNP nor SCCC ever used or produced toluene in any of their processes. Sampling also indicated that there was a significant difference in pH between the perched water table in the fill and the groundwater of the lower sand layer. The pH of the groundwater in the fill was basic (8.4-11.4), while the pH of the groundwater in the lower sand layer was acidic (2.0-6.3). (Results of the current RI revealed that these differences in pH are not consistent across the site.) The highest VOC concentrations were found in the lower sand layer.

1.3.2.3 Lithology and Groundwater Flow

Lithology at the site is composed of a chromium slag fill material overlying a peaty silt layer referred to as the meadow mat. Under the meadow mat is a fine- to medium-grained layer of sand which overlies a regionally extensive clay. Figure 1-3 is a cross section of the shallow lithology at the site. Groundwater is first encountered in the fill material above the meadow mat where the shallow wells were screened. The deeper wells were screened in the sand below the meadow mat.

Table 1-2

Summary of Groundwater Results (1983)
SCCC, Kearny, NJ

Parameters	1S	1D	2S	2D	3S	3D	4S	4D	5S	5D
pH	8.4	6.3	9.3	5.6	8.8	5.3	11.4	4.8	11.4	2.0
Conductivity (umhos)	1050	2150	5000	5000	2450	2400	5000	5000	5000	5000
Total Chromium	<0.05	<0.05	7.7	0.3	0.29	0.06	101.7	0.44	NA	44.3
Hexavalent Chromium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	97.0	<0.1	NA	<0.1
Benzene	ND	125	ND	1000	65	670	ND	220	190	50
Chlorobenzene	ND	1850	1500	660	55	ND	93000	13900	450	ND
1,1,2-trichloroethane	ND	ND	ND	ND	ND	ND	ND	30	ND	ND
1,1-dichloroethylene	ND	ND	ND	ND	ND	ND	ND	20	ND	ND
trans-1,2-dichloroethylene	ND	ND	ND	30	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	300	ND	310	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND	25	ND	ND	5350	ND	ND
Toluene	ND	ND	ND	435	ND	640	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	20	35	ND	ND	13960	ND	ND
Total Xylenes	ND	ND	ND	745	55	1550	ND	ND	ND	ND
Acenaphthene	ND	ND	ND	ND	540	28	10	ND	ND	4300
Anthracene	ND	ND	ND	ND	630	64	10	ND	ND	120
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	ND	ND	22	31	12	ND
1,2-dichlorobenzene	ND	1500	ND	2700	ND	ND	ND	4900	ND	ND
1,3-dichlorobenzene	ND	3100	ND	1400	ND	ND	ND	ND	ND	ND
1,4-dichlorobenzene	ND	4100	ND	3700	ND	ND	10	ND	ND	ND
Dimethyl phthalate	ND	ND	ND	ND	10	ND	ND	ND	ND	ND
Di-n-butyl phthalate	ND	10	ND	19	ND	ND	ND	32	10	ND
Fluoranthene	ND	ND	ND	ND	86	ND	ND	ND	ND	ND
Flourene	ND	ND	ND	ND	570	ND	ND	ND	ND	ND
Naphthalene	ND	10	ND	ND	ND	53	510	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	170	ND	ND	ND	ND	ND
1,2,4-trichlorobenzene	ND	10	ND	ND	ND	ND	ND	ND	10	ND
1,2-diphenyl hydrazene	ND	ND	ND	ND	ND	ND	ND	ND	ND	37
Detection Limits*	10/10	10/10	10/10	5/10	10/10	10/10	250/10	10/10	5/10	5/10

NA = Not Analyzed

ND = Not Detected

* = First number is the detection limit for volatile organics, the second number is the detection limit for base-neutrals. Detection limits will vary with degree of contamination.

Note: All concentrations in parts per billion (ppb), except where noted.

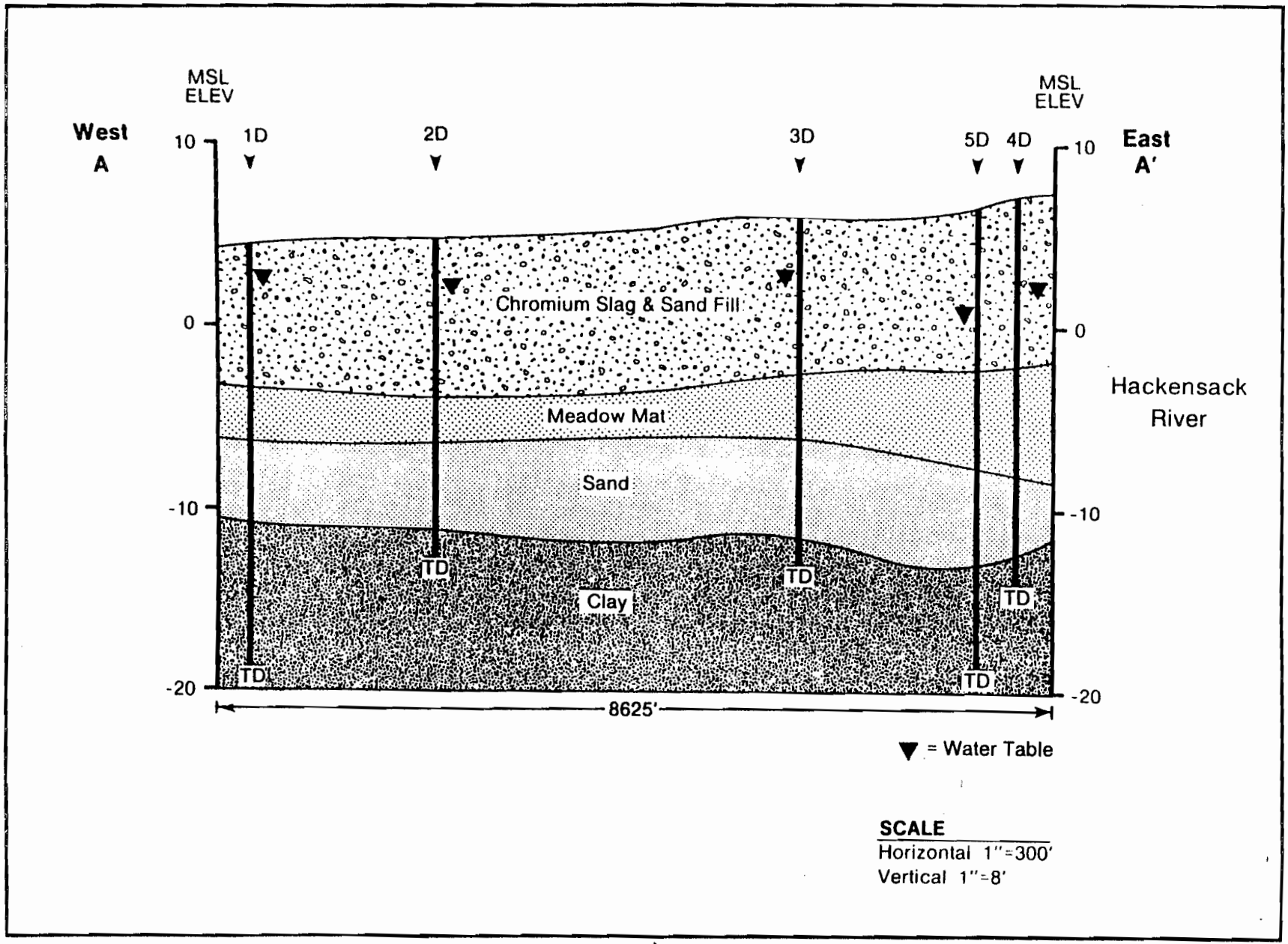

FIGURE 1-3 | WEST-EAST GEOLOGIC CROSS-SECTION
STANDARD CHLORINE CHEMICAL COMPANY, KEARNY, NJ

Groundwater elevations were calculated from both the SCCC and Diamond Shamrock properties to produce flow maps of the shallow and deeper water zones. Figure 1-4 shows the groundwater flow direction in the fill which is mostly to the south-southeast towards the drainage ditch on the SCCC property. There is also a component of flow to the northeast in that part of the property. Figure 1-5 shows the groundwater flow in the sand below the meadow mat which is mostly to the south and southwest towards the drainage ditch.

1.3.3 Hydrochloric Acid Spill (1985)

An NJDEPE inspection report dated 17 October 1985 disclosed that, on 7 October 1985, the bottom of an above-ground storage tank on the site ruptured while the tank was being filled, resulting in the discharge of approximately 4,000 gallons of 31 percent hydrochloric acid onto the ground at the site. The acid flowed into a drainage ditch where it was contained within a diked area, neutralized with sodium hydroxide, and removed by SCCC using a vacuum system. Sampling was not conducted during these activities.

1.3.4 Dioxin Investigations

In 1985, NJDEPE conducted the Phase II Dioxin Investigation, which identified 23 sites in New Jersey suspected of being contaminated by halogenated dibenzo-p-dioxins, specifically dioxin isomer 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). This program was sponsored by the NJDEPE and the United States Environmental Protection Agency (USEPA) to identify potential dioxin contamination in the State of New Jersey. The site was included in the NJDEPE Phase II Dioxin Investigation because SCCC once produced and stored two potential precursor dioxin-related compounds at the site, orthodichlorobenzene (1963 to 1987) and 1,2,4-trichlorobenzene (1970 to 1980).

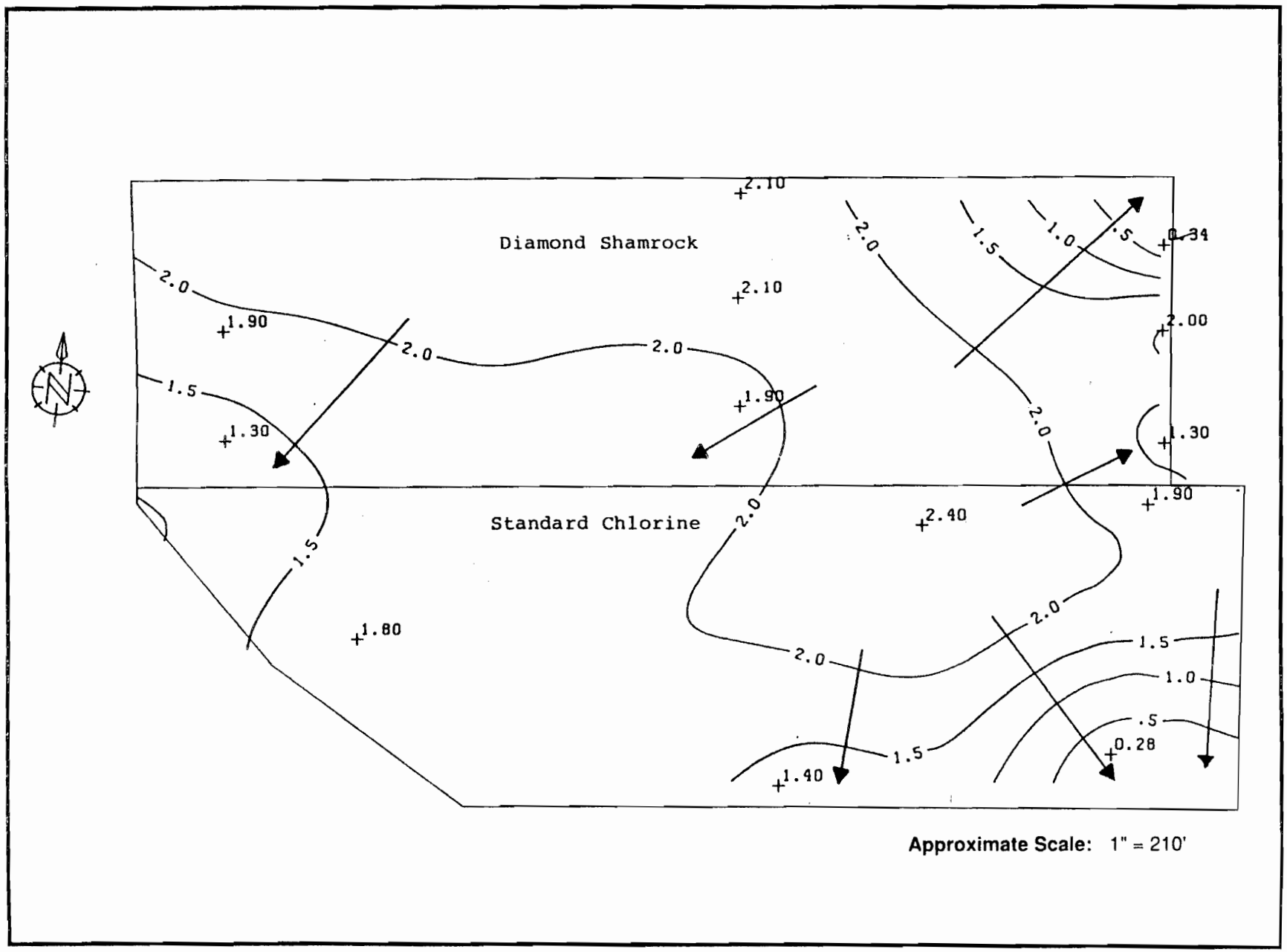

FIGURE 1-4 GROUNDWATER ELEVATIONS IN THE FILL, 4 AUGUST 1983

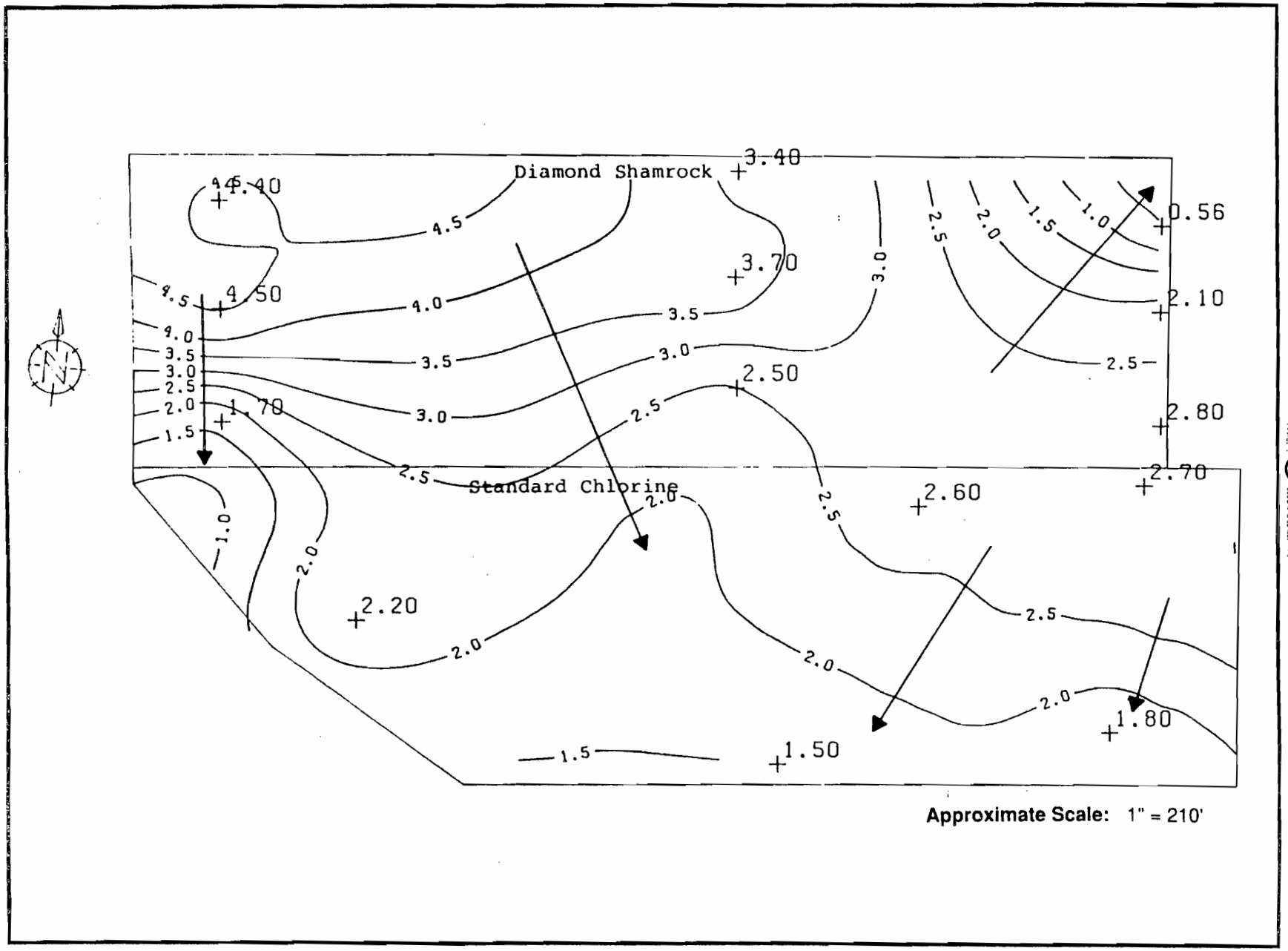

FIGURE 1-5 GROUNDWATER ELEVATIONS IN LOWER SAND, 4 AUGUST 1983

As part of the NJDEPE Phase II Dioxin Investigation, ten areas were identified at the site as having potential for dioxin contamination. In May 1985, as part of the NJDEPE Phase II Dioxin Investigation, 17 soil and sediment samples were collected from 15 locations in these areas (Figure 1-6). The results of the analyses of these samples are presented in Table 1-3. Sample number 16, collected from the west lagoon, contained 59.5 ppb of dioxin, and sample number 12, collected near the dichlorobenzene storage tanks, contained 0.52 ppb of 2,3,7,8-TCDD. Dioxin was not detected in the 13 other surface soil and sediment samples, including the seven samples collected west of the railroad right-of-way. Based on these results, it was recommended that future investigations focus on the two former process wastewater lagoons, with some additional sampling near the dichlorobenzene tanks.

On 3 July 1985, pursuant to the Executive Order Number 109 and the Administrative Order EO.-109-1, NJDEPE ordered SCCC to conduct further dioxin sampling to determine the extent of 2,3,7,8-TCDD contamination at the site. On 23 July 1985, SCCC submitted a sampling plan for dioxin to NJDEPE for review. SCCC selected locations for obtaining sediment and soil samples. SCCC subsequently revised the sampling plan pursuant to NJDEPE comments. On 5 August 1985, SCCC submitted a final sampling plan which was approved by NJDEPE.

In August 1985, SCCC collected soil and sediment samples at the site for dioxin analysis in accordance with the sampling plan. Samples were obtained from surface and subsurface soils, lagoon sediments, Hackensack River sediments, and from within several building areas at the site (see Figure 1-7). Laboratory analysis of the samples revealed possible dioxin contamination at the site, 2,3,7,8-TCDD was detected in four out of six lagoon sediment samples at concentrations up to 62.1 µg/kg (see Table 1-4). One surface soil sample collected adjacent to the distillation building contained 5.0 µg/kg of 2,3,7,8-TCDD. The 17 soil samples collected from the lagoon perimeter and the riverbank did not contain detectable levels of 2,3,7,8-TCDD. During lagoon boring drilling activities, various waste materials were found in the bottom of the lagoons, including up to 3 ft of

Table 1-3

Results of Phase II Dioxin Investigation
SCCC, Kearny, NJ

Sample Collection Date: 7 May 1985
Sample Analysis Date(s): 15, 16, and 17 May; 16 and 17 June 1985 Environmental Testing and Certification Corporation, Edison, New Jersey

Sample Number	2,3,7,8-TCDD (ppb[1])		Sample Type
	Measured	DL[2]	
1	ND[3]	0.15	Surface soil
2	ND	0.60	Surface soil
3	ND[6]	0.037	Surface soil
4	ND	0.62	Surface soil
5	ND	0.42	Duplicate of Sample 4
6	ND	0.54	Surface soil
7	ND	0.67	Sediment
8	ND	0.23	Surface soil
9	ND	0.25	Field/equipment blank
10	ND	0.29	Surface soil
11	ND	0.16	Surface soil
12	0.52[4]	--	Surface soil
13	ND	0..70	Surface soil
14	ND	0.62	Surface soil
15	ND	0.29	Surface soil
16	59.5[4]	--	Sediment
17	--[5]	--	Sediment
18	ND	0.11	Equipment blank
19	4.90	--	Proficiency

1 ppb = Parts per billion, i.e., µg/kg of soil or sediment on an "as is" basis.
2 DL = Method detection limit which is the concentration at which there is a 99 percent confidence level that the compound is present. ETC only reports detection limits for non-detect results.
3 ND = Not detected.
4 Repeat analysis, required for quality assurance review.
5 Repeat analysis unsuccessful - failed surrogate recovery.
6 Results of re-analysis by California Analytical Laboratories of West Sacramento, California, on 16 September 1985.

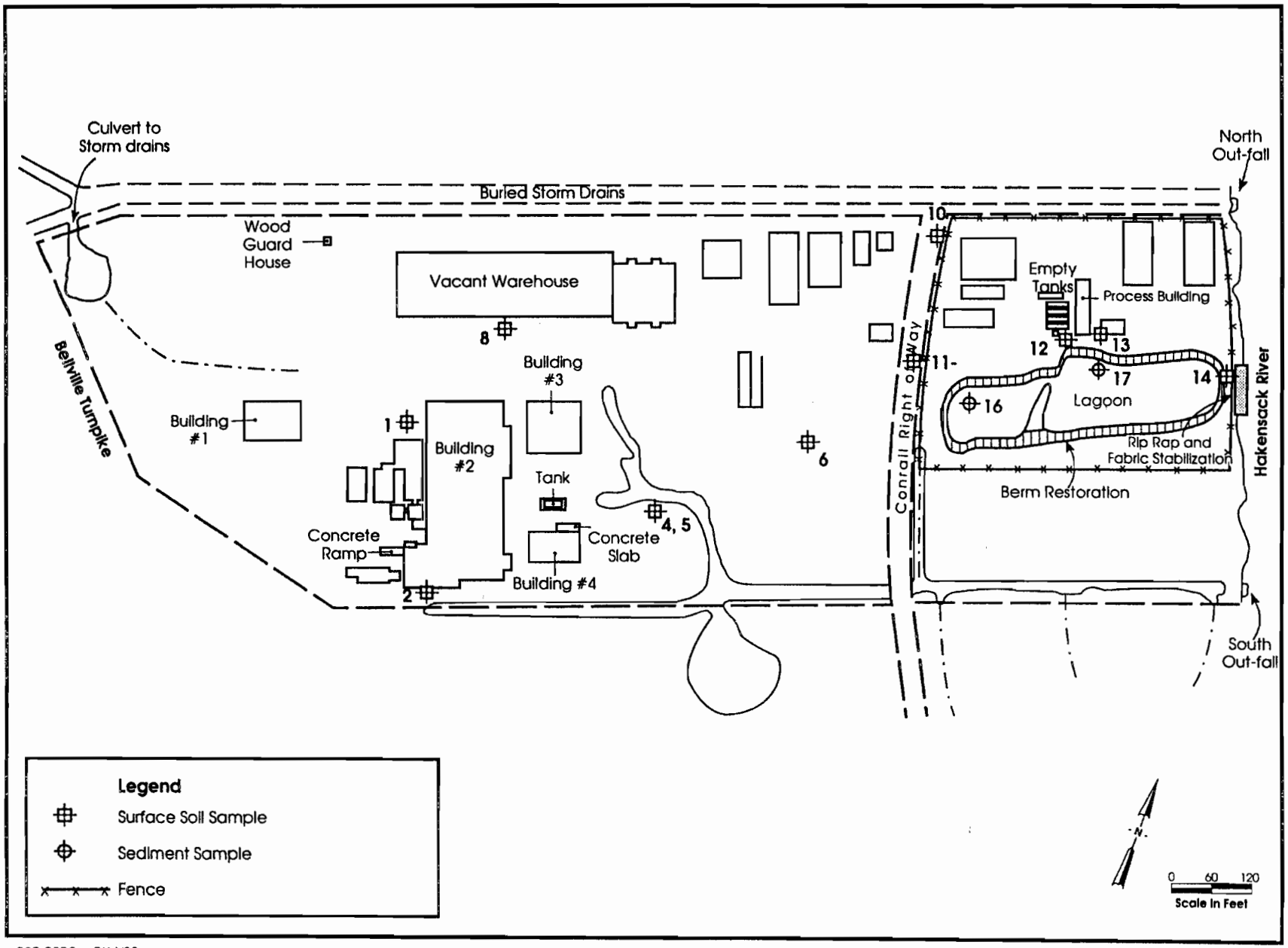

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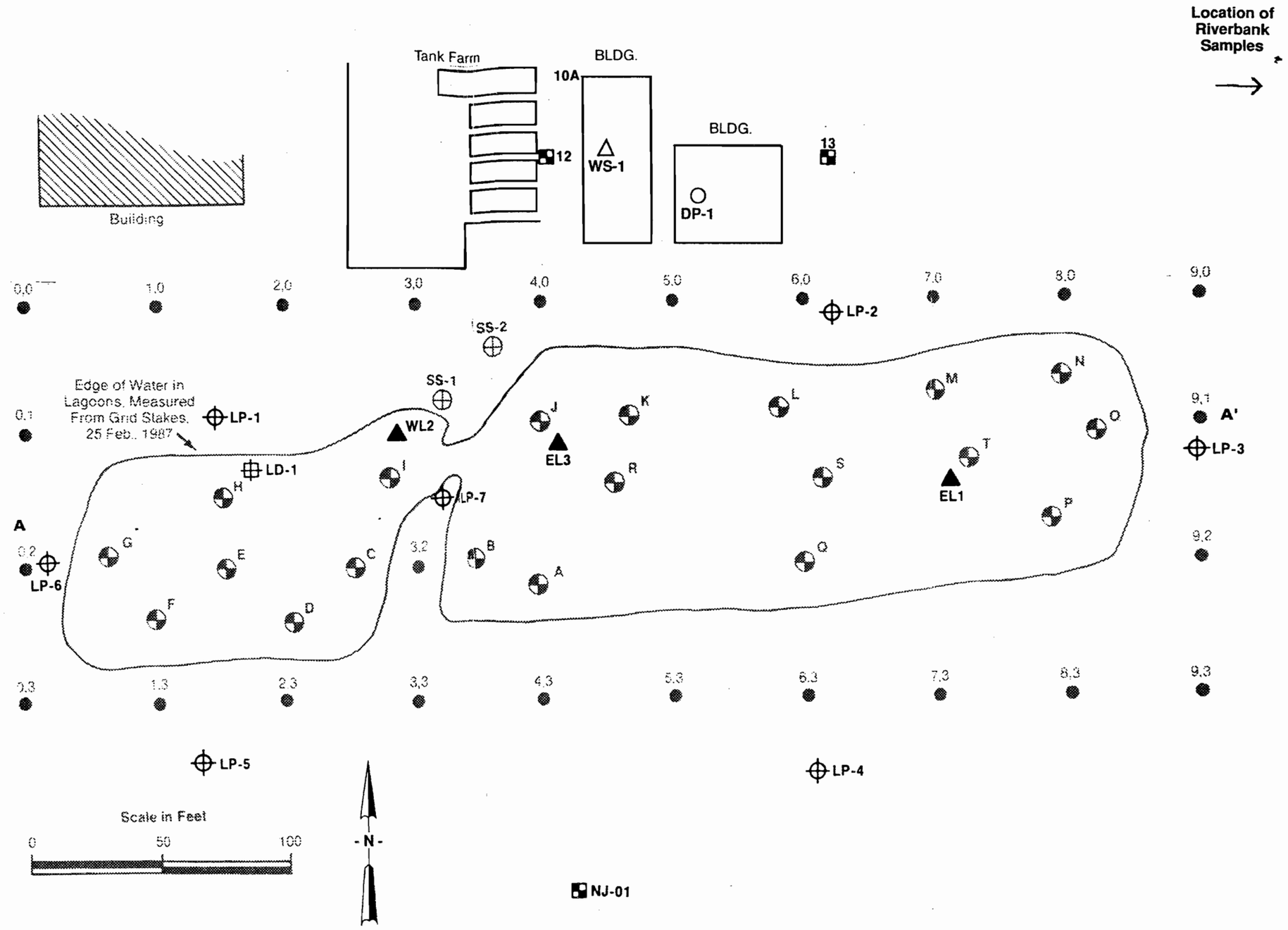
FIGURE 1-6 SAMPLING LOCATIONS, PHASE II DIOXIN INVESTIGATION STANDARD CHLORINE, KEARNY, NJ

Note:
Two samples, one wipe sample and one residue sample, were collected inside the distillation building at locations as directed by NJDEP personnel.

Locations of 1987 samples shown in half tones.

Four borings completed along west bank of Hackensack River, numbered RB-1, RB-2, RB-3, RB-4. Samples listed in summary which follows. One sample (DP—1) collected from still pot.

Locations of building and tank areas not surveyed.



Legend - 1985 Sampling

EL3	Lagoon Borings
LP-1	Lagoon Perimeter Borings
12	Hand Auger Borings
LD-1	Lagoon Dredge Sample
WS-1	Wipe Sample
DP-1	Still Pot Samples

Legend - 1987 Sampling

A	Location of Core/Spoon Samples
SS-1	Location of Surface Soil Grab Sample, as Directed by NJDEP Personnel
3.3	Location of Grid Stake

FIGURE 1-7 DIOXIN SAMPLING LOCATIONS AUGUST 1985 AND FEBRUARY-MARCH 1987

Table 1-4

Summary of 2,3,7,8-TCDD Concentrations in Soil Samples Collected in August 1985 SCCC, Kearny, NJ

Sample	Depth (ft)	Detection Limit 2,3,7,8-TCDD (µg/kg)
Riverbank		
RB-2A	0-0.5	<0.07
RB-2C	1.5-2.0	<0.16
RB-3A	0-0.5	<0.10
RB-3B	1.5-2.0	<0.23
Lagoon Perimeter		
LB-1A	0-0.5	<0.05
LP-1B	1.5-1.7	<0.12
LP-2	0.5-WT	<0.67
LP-3A	0-0.5	<0.02
LP-3C	3.5-4.0	<0.17
LP-4A	0-0.5	<0.16
LP-4B	6.0-6.5	<0.15
LP-5A	0-0.5	<0.10
LP-5D	3.6-4.1	<0.01
LP-6A	0-0.5	<0.03
LP-6B	0.5-WT	<0.05
LP-7A	0-0.5	<0.09
LP-7B	1.7-2.1	<0.38
Lagoon		
LD-1	--	3.1/9.6[b]
EL-1	0-0.5	<0.10
EL-1D	0-0.5	<0.10
EL-3	0-0.5	62.1
WL-2	0-0.5	<75.5[a]/55.6[b]
WL-2D	0-0.5	45.2
Other Areas		
10A	0-0.5	5.0
12	1.5-2.0	<0.23
13	1.5-2.0	<0.13
NJ-01	--	<0.16
DP-1	--	<0.07

Note: Samples analyzed by Cal. Analytical. A, B, C, D indicate depths at the Riverbank, Lagoon Perimeter and Other Area locations. E1-1D is a duplicate sample.

WT = Water table.

[a] = Chemical interferences.

[b] = Duplicate analyses.

white to brown colored crystals underlain by up to 4 ft of a black tar substance.

In a letter dated 24 April 1986, NJDEPE required SCCC to submit a work plan for further dioxin sampling to determine the horizontal and vertical extent of dioxin contamination at the site. On 17 October 1986, SCCC submitted a work plan for dioxin sampling to NJDEPE. SCCC revised this work plan pursuant to NJDEPE comments and it was approved by NJDEPE on 21 January 1987.

From 25 February to 18 March 1987 (Stage I), SCCC collected samples from borings located in a grid fashion across the two lagoons at the site as indicated in Figure 1-7. Samples were collected at four depths at a total of 20 locations. The first and second sample intervals from each location were analyzed for 2,3,7,8-TCDD (dioxin). The two deeper samples for each location were archived. The deeper samples were to be analyzed only if the shallow samples revealed the presence of dioxin. Dioxin was detected in less that half the samples at concentrations ranging from .23 ppb to 69.6 ppb (see Table 1-5).

NJDEPE required SCCC to analyze the archived samples collected from 25 February 1987 to 18 March 1987 (Stages II and III). The sampling analysis showed high concentrations of dioxin at various locations and depth in the lagoons, particularly at location J (see Table 1-6).

SCCC submitted a report to the Department dated May 1988 which summarized the results of the dioxin investigation. As part of the report's findings, the extensive dioxin sampling and analysis indicated that dioxin contamination exists throughout the vertical extent of the waste material in the lagoons and across most of the horizontal extent of the lagoons. Additional findings included a characterization of lagoon waste layers and subbase. Two types of wastes were found at the base of the lagoon:

- One to 3 ft of white to brown bladed crystals mixed with silt.

Table 1-5

Stage I Analysis Summary
SCCC, Kearny, NJ

WESTON Sample Number	TCDD Measured (ppb)	TCDD Detection Limit (ppb)
Method Blank	ND	0.13
Method Blank	ND	0.092
S-1-SS	ND	0.41
R-1-SS	15.3	--
N-1-SS	ND	0.62
N-1-SS Dup	ND	0.49
L-1H-SS	0.71	--
E-1	0.85	--
I-1H	ND	1.1
P-1-SS	ND	0.60
O-1-SS	ND	0.33
O-FP-SS	ND	0.53
O-FP-SS-NS	9.2	--
B-1	8.2	--
J-1H	11.2	--
STDCL-1A	ND	0.25
STDCL-1B	9.2	--
C-2H-SS	0.23	--
C-2H-SS Dup	ND	0.45
M-1-SS	ND	0.36
K-1H-SS	69.6	--
O-1-SS	ND	0.56
O-1-SS-NS	8.2	--
O-1D-SS	ND	0.26
Method Blank	ND	0.12
Method Blank	ND	0.20
SS-1	ND	1.1
SS-2	ND	1.4
F-1	*	*
G-1	2.8	--
H-1	ND	0.73
D-1	ND	0.90
T-1-SS	ND	0.23
A-1	2.6	--
Method Blank	ND	0.034
T-2-SS	ND	0.21
S-2-SS	ND	0.076

Table 1-5 (continued)

WESTON Sample Number	TCDD Measured (ppb)	TCDD Detection Limit (ppb)
R-2-SS	62.1	--
E-2-SS	31.9	--
N-2-SS	ND	0.18
O-2-SS	ND	0.028
P-2-SS	ND	0.11
C-1	19.5	--
C-1 Dup	16.3	--
I-2-SS	3.2	--
I-3-SS	38.4	--
I-4-SS	6.2	--
D-2-SS	ND	0.053
G-2-SS	ND	0.12
B-2-SS	ND	0.11
M-2-SS	ND	0.084
K-2-SS	2.7	--
H-2-SS	ND	0.13
A-2-SS	ND	1.5
Q-2D-SS	ND	0.089
STDCL-2B	3.5	--
Method Blank	ND	0.087
I-1H NS	1.3	--
Method Blank	ND	0.19
Method Blank	9.4	--
WS-1	9.6	--
WS-2	ND	0.61
Method Blank	ND	0.17
Method Blank NS	9.6	--
RS-1	0.14	--
F-4-SS	4.3	--
J-2-SS	*	*
J-3-SS	*	*
J-4-SS	*	*

ND = Not Detected.

* = Results of this sample analysis not reported due to crystallization of liquid phase following extraction.

Note: The samples collected were lagoon sediments except for the following: STDCL indicates EPA performance test; SS-1, SS-2 were surface soils; WS-1 was a wipe sample, foundation; WS-2 was a wipe sample, blank.

Source: WESTON, 1987

Table 1-6

Stage II and III Analysis Summary
SCCC, Kearny, NJ

WESTON Sample Number	2,3,7,8-TCDD Measured (ppb)	2,3,7,8-TCDD Detection Limit (ppb)
Method Blank	ND	0.016
Method Blank	ND	1.6
MBNS	0.85	--
MBNS	0.83	--
R-3-SS	190	--
R-4-SS	46	--
R-4-SS Dup	43	--
E-3-SS	2.9	--
E-3-SS NJ	10.3	--
E-4-SS	1.2	--
F-1	2.3	--
O-2-SS	ND	0.35
K-4-SS	3.7	--
J-3-SS	268	--
J-3-SS	237	--
J-3-SS NJ	273	--
J-4-SS	148	--
K-3-SS	6.1	--
J-2-SS	*	*
STDCL-4B	6.8	--
STDCL-3A	9.9	--

ND = Not Detected.

* = Results of this sample analysis not reported due to crystallization of liquid phase following extraction.

Note: The samples collected were lagoon sediments; STDCL indicates EPA performance tests; MBNS was a method blank; NJ is a samples split with NJDEP.

Source: WESTON, 1988

- Two to 4 ft of predominantly black tar, soft to hard, containing variable proportions of brick and wood debris.

These lagoon wastes are directly underlain by native material referred to as meadow mat, with abundant roots (see Figure 1-8). The lagoons were constructed by excavation through a fill material consisting of a granular chromium slag.

Recommendations of the study included the installation and sampling of additional monitor well pairs around the lagoons to evaluate the migration of dioxin into underlying hydrogeologic units. The wells were recommended to monitor the most shallow water-bearing unit (above the meadow mat) and the next deepest water-bearing unit (immediately below the meadow mat).

1.4 REPORT ORGANIZATION

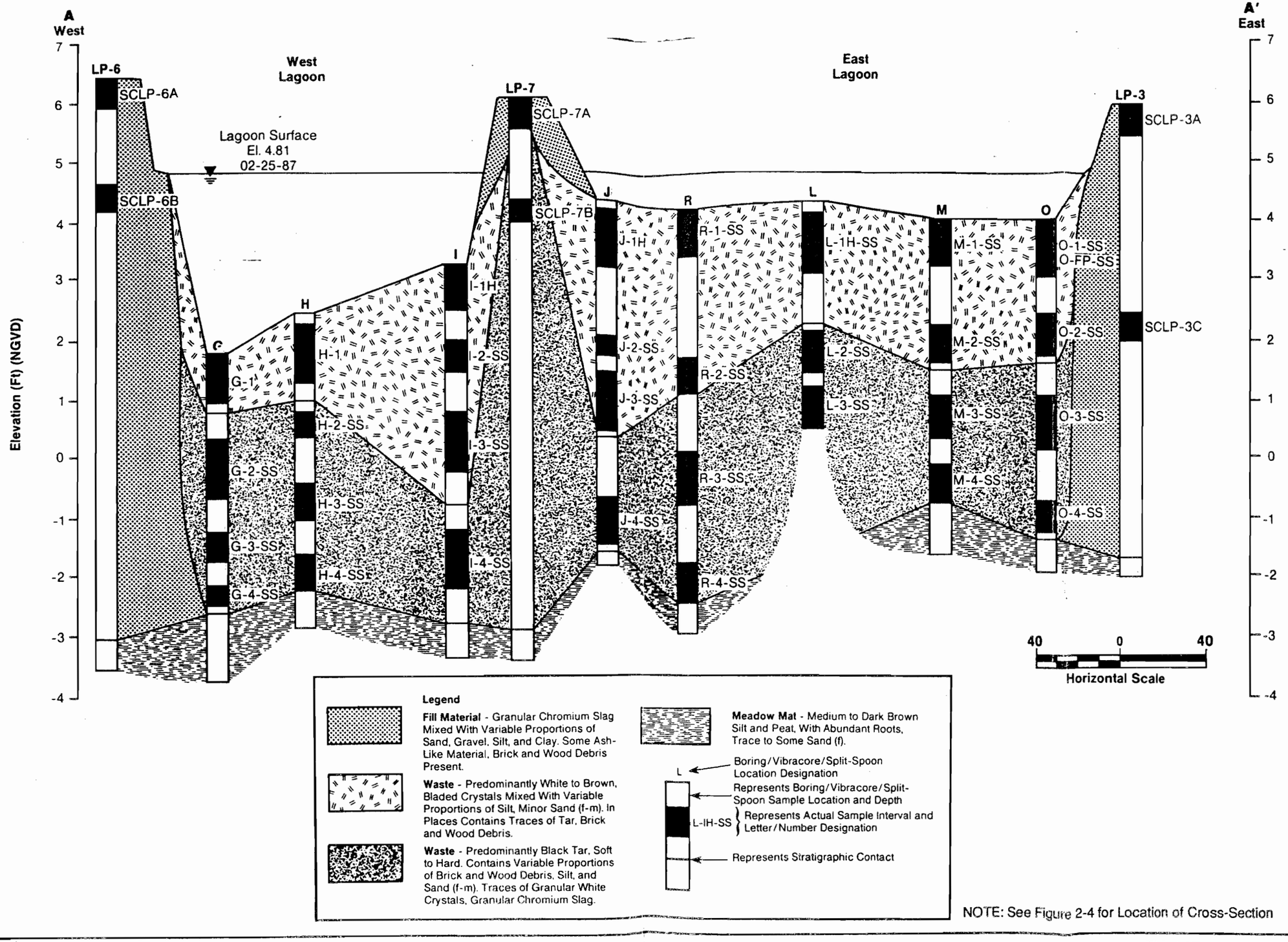
This report has been organized to present the results of the RI investigation, including:

- Section 2 - Discusses the environmental setting of the site, including land use, demographics, topography, surface drainage; regional and site-specific geology and hydrogeology.

- Section 3 - Provides information of the Interim Measures completed as required by the ACO.

- Section 4 - Summary of the activities and methodologies used to complete the RI investigation.

- Section 5 - Results of the Remedial Investigation.



Legend

Fill Material - Granular Chromium Slag Mixed With Variable Proportions of Sand, Gravel, Silt, and Clay. Some Ash-Like Material, Brick and Wood Debris Present.

Waste - Predominantly White to Brown, Bladed Crystals Mixed With Variable Proportions of Silt, Minor Sand (f-m). In Places Contains Traces of Tar, Brick and Wood Debris.

Waste - Predominantly Black Tar, Soft to Hard. Contains Variable Proportions of Brick and Wood Debris, Silt, and Sand (f-m). Traces of Granular White Crystals, Granular Chromium Slag.

Meadow Mat - Medium to Dark Brown Silt and Peat, With Abundant Roots, Trace to Some Sand (f).

L — Boring/Vibracore/Split-Spoon Location Designation

Represents Boring/Vibracore/Split-Spoon Sample Location and Depth

L-IH-SS — Represents Actual Sample Interval and Letter/Number Designation

Represents Stratigraphic Contact

NOTE: See Figure 2-4 for Location of Cross-Section

FIGURE 1-8 STRATIGRAPHIC CROSS-SECTION A-A'

- Section 6 - Summary and Conclusions.

- Section 7 - Bibliography.

SECTION 2
ENVIRONMENTAL SETTING

2.1 LAND USE AND DEMOGRAPHICS

The SCCC site is located in Kearny, New Jersey, along the tidal portion of the Hackensack River. Land in the area of the site is mostly devoted to industrial, commercial, and transportation uses. The site is surrounded by industrial properties, railroads and highways. Sites immediately to the north and south are abandoned industrial properties also under remedial investigation in response to NJDEPE enforcement. There are no residential developments in the vicinity of the site. Both sides of the Hackensack river are meadow lands that have been extensively filled in for industrial development.

Kearny, as well as the rest of Hudson County, is part of the metropolitan area of New York City. As part of the New York City area, population grew quickly from the late 19th century through the first half of the 20th century. Along with the urbanization came industrial and transportation development. The industrial development occurred along the navigable waterways and railroads and later near the exists of major highways. Population growth slowed after 1950 with many people moving to suburban developments further away.

2.2 TOPOGRAPHY AND SURFACE DRAINAGE

The site is located in flat former meadow land that has been filled in. The site is bounded on the east by the Hackensack River (a tidal river), and on the southeast by an unnamed drainage ditch. A partially filled marsh area lies south of the drainage swale (the Koppers property). The drainage ditch receives runoff from the marsh, the Koppers property, drainage ditches along Belleville Turnpike and other adjacent areas. Surface water in the ditch and adjacent marsh is discolored with oily material and a pale yellow

skim, possibly associated with the chromium waste. The creek and marsh are separated from the Hackensack River by a berm and the outflow culvert has a tidal gate which prevents backflow during high tides. Flow appears sluggish and water ponds in a deepened area around the culvert, allowing suspended sediment to settle out so there is normally little sediment load to the river from the ditch.

The drainage ditch also receives flow from drainage ways near Buildings 2, 3, and 4 in the southwestern portion of the site. This flow includes NPDES permitted wastewater effluent from currently active SCCC buildings. A small drainageway along the eastern side of the abandoned railroad spur in the center of the site also drains southward into the ditch. A pipe under the road along the northern boundary of the site also discharges to the Hackensack River through a tidal gate near the northeast corner of the SCCC property. The pipe carries runoff from Belleville Turnpike and from a drainage depression in the northeast corner of the SCCC property. Figure 2-1 is a site map of the SCCC property.

2.3 GEOLOGY

The SCCC site is located in the lower region of the Hackensack River Basin. The general geology and hydrology of this river basin have been described by Carswell (1976) in a U.S. Geological Survey Water Resources Investigation (No. 76-74). Carswell indicates that the bedrock in the general area consists of the Newark group of Triassic age. The Brunswick formation forms the upper unit of this group and is the bedrock at this site and throughout the area of consideration. It is composed of mudstone, siltstone, sandstone, and conglomerate and is reddish-brown in color. Depth to bedrock in the vicinity of the site ranges between 50 and 100 ft.

Overlying the Brunswick formation are deposits of glacial till and stratified drift. The glacial till is described as an unsorted mixture of sand, gravel silt and clay, and is of an average thickness of approximately 25 ft. The stratified drift lying above the till consists

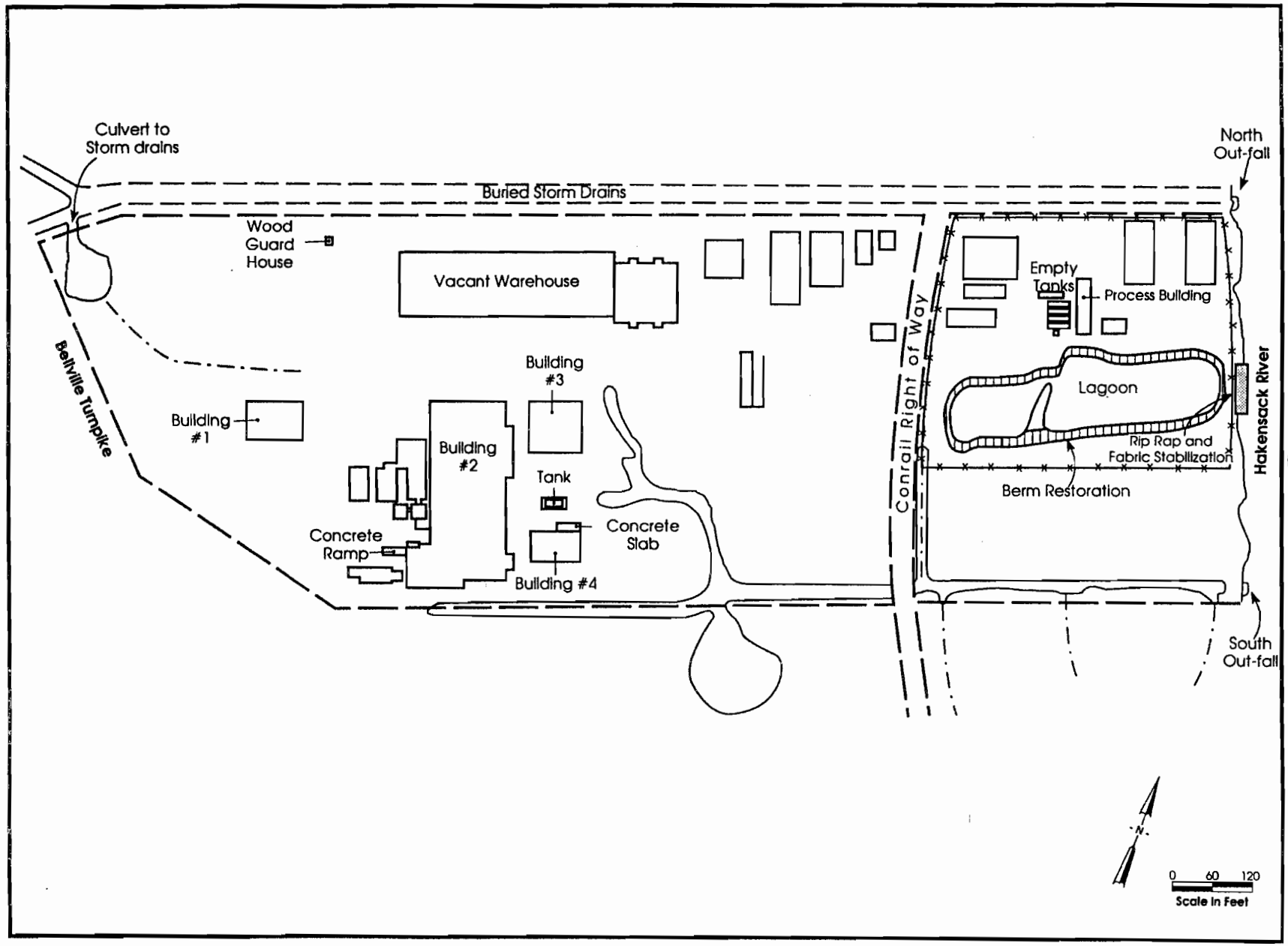


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**FIGURE 2-1 SITE MAP
STANDARD CHLORINE,
KEARNY, NJ**

of varved silt and clay deposited in a fresh water lake environment (Lake Hackensack). Alluvium (sand), deposited by present-day streams, overlies the silt and clay formation. This alluvium is restricted to the flood plain of the stream. The natural surface material above the alluvium is an organic material commonly called peat or meadow mat, consisting of marsh vegetation in various stages of decay. At the base of these materials, there is often a completely decomposed, amorphous peat containing large quantities of silt.

Borings drilled at the site indicated SCCC property is underlain by 8 to 10 ft of fill consisting of yellow-brown to black chrome slag and reddish-brown to tan silty sand. The fill is underlain by the original organic ground surface material called the "meadow mat," which is a layer of dark organic silt, humus and peat 2 to 5 ft thick. The meadow mat was encountered in all the borings and is reported to extend throughout the area surrounding the site. The meadow mat forms a faintly undulating surface beneath the fill and is generally thickest under the eastern portion of the site near the river.

Below the meadow mat lies 4 to 7 ft of very fine to coarse, light brown to light gray sand underlain by a very dense gray sand. Beneath the sand is a very stiff gray clay, occasionally varved with red clay. The site borings only penetrated the top of the clay, however, a compilation of area drilling logs by the New Jersey Geologic Survey (1959) indicates that the clay is extensive and thick. Beneath the clay lies a thin layer of glacial till (Carswell, 1976 U.S.G.S. Water Resources Investigation No. 76-74) which in turn overlies bedrock consisting of red shales and sandstones of the Triassic-age Brunswick formation.

Information obtained from investigations completed at the Koppers site south of the SCCC Kearny plant (Keystone, 1990) and from a report on the bedrock in the vicinity (NJDEP Geological Survey, 1959) indicates that the depth to bedrock in the area varies from 60 to 100 ft below grade. Well records obtained from NJDEPE files indicate that a production well was drilled on the SCCC site (then owned by White Tar Company) in

1917 with bedrock at 73 ft. Another well record of a monitor well installed at the Koppers site just south of SCCC indicates that the clay is 58 ft thick, occurring 19 to 77 ft below ground surface, and underlain by 11 ft of glacial till consisting of fine to coarse sand, gravel, and weathered bedrock. The Brunswick shale was found at 89 ft below ground surface. Based on the well records and geologic literature, the lithology described above is consistent throughout the area.

2.4 HYDROGEOLOGY

Shallow groundwater occurs under the water table conditions throughout the site and general area. For the purposes of this investigation two shallow water-bearing zones have been identified under the site. The upper zone is encountered in the fill material above the meadow mat where the water table occurs within a few feet of the surface. The lower zone occurs in the natural sand layer that is above the clay. The meadow mat separates the fill from the lower sand layer. Groundwater recharge occurs from percolation of precipitation through the permeable fill. Head differences between wells above and below the meadow mat indicate that the mat is a limited hydraulic barrier between the fill and the underlying sands. The shallow groundwater encounters a major hydraulic barrier in the clay underlying the sand layer. Groundwater flows laterally in the sands and discharges to surface water drainage south of the site, and to the Hackensack River.

No tidal influence was observed in the monitor wells screened in the fill material. The monitor wells screened in the lower sand layer showed water level fluctuations ranging from 0 to 1.75 ft due to tidal fluctuations in the Hackensack River. Earlier studies at Diamond Shamrock indicated that the tidal fluctuation in the river causes the groundwater flow direction in the lower sand layer to shift slightly between southeasterly and southerly under the eastern portion of the site, while the tidal effect on the water table in the fill is negligible. Water flow direction was not changed significantly on the SCCC property during readings obtained during the RI, although the lack of tidal influence on the shallow water table above the meadow mat was observed.

The shallow groundwater above the clay is not a significant source of groundwater. The unit is thin and contains brackish water. A well record search indicated no domestic or potable groundwater use in the area. The industrial groundwater supplies in the area are obtained from the bedrock (Brunswick formation), which is separated from the shallow groundwater-bearing units by a layer of clay that acts as an aquitard. This clay layer is continuous underneath the site. Groundwater was tested at the Koppers site, just south of SCCC, in the glacial till below the clay and just above bedrock. This water-bearing zone appears to be under semi-confined conditions.

2.5 WELL RECORD SEARCH

A well record search was completed for a one-mile radius around the SCCC Kearny site. Two records (mentioned in Subsection 2.3) were found within 1/2 mile, including an old production well drilled on the site in 1917. According to the file, this well was intended to provide water for boilers but could not be used because of the high level of dissolved solids of the water. It is not known where the location of the well was on the site nor are there any records that the well was abandoned. The other well found within a half mile radius was a deep monitor well from the Koppers site south of SCCC. Records of other production wells installed approximately 1 1/2 miles west-southwest of the site indicate that the water is also brackish. Based on these well records, it appears that the groundwater from the Brunswick shale in this area is not suitable as a present or future source of potable water. There are no records of any use in the vicinity of the shallow groundwater. The well records are in Appendix A.

SECTION 3
INTERIM REMEDIAL MEASURES

3.1 INTERIM MEASURES INITIATED BY SCCC

In compliance with the Administrative Order, Section II A and Appendix A, SCCC performed a series of Interim Remedial Measures (IRM) at the site intended to secure the site against authorized entry, to prevent stormwater overflow from the lagoon, and to prevent future possible releases of product from on-site storage tanks. A draft IRM Work Plan was submitted to NJDEPE on 17 November 1990. NJDEPE reviewed and commented on the plan and the Final IRM Work Plan was submitted to NJDEPE on 16 February 1990. The work outlined in the plan consisted of the following main elements discussed in Subsections 3.1.1 through 3.1.3. An additional IRM is discussed in Subsection 3.1.4.

3.1.1 Security of The Old Production Area

Security for the active western portion of the SCCC property consists of a 24-hour guard station located at the main entrance which is off the access road along the northern property boundary. Access to the inactive eastern portion of the site is also along this road. It is necessary to pass the guard house but not through the gate. In order to ensure security of the inactive area, a chain link fence was installed around the eastern portion of the site which includes the former storage and production buildings, above ground storage tanks formerly used to store product and the lagoons. The fence encloses an area bounded on the east by the Hackensack River, on the west by the Erie Lackawanna railroad right-of-way, on the north by the boundary road, and on the south by an east-west line approximately 50 ft south of the lagoon (Figure 3-1). The fence is 8 ft high with two locked access gates. Warning signs were also posted on the fence at regular intervals around the perimeter.

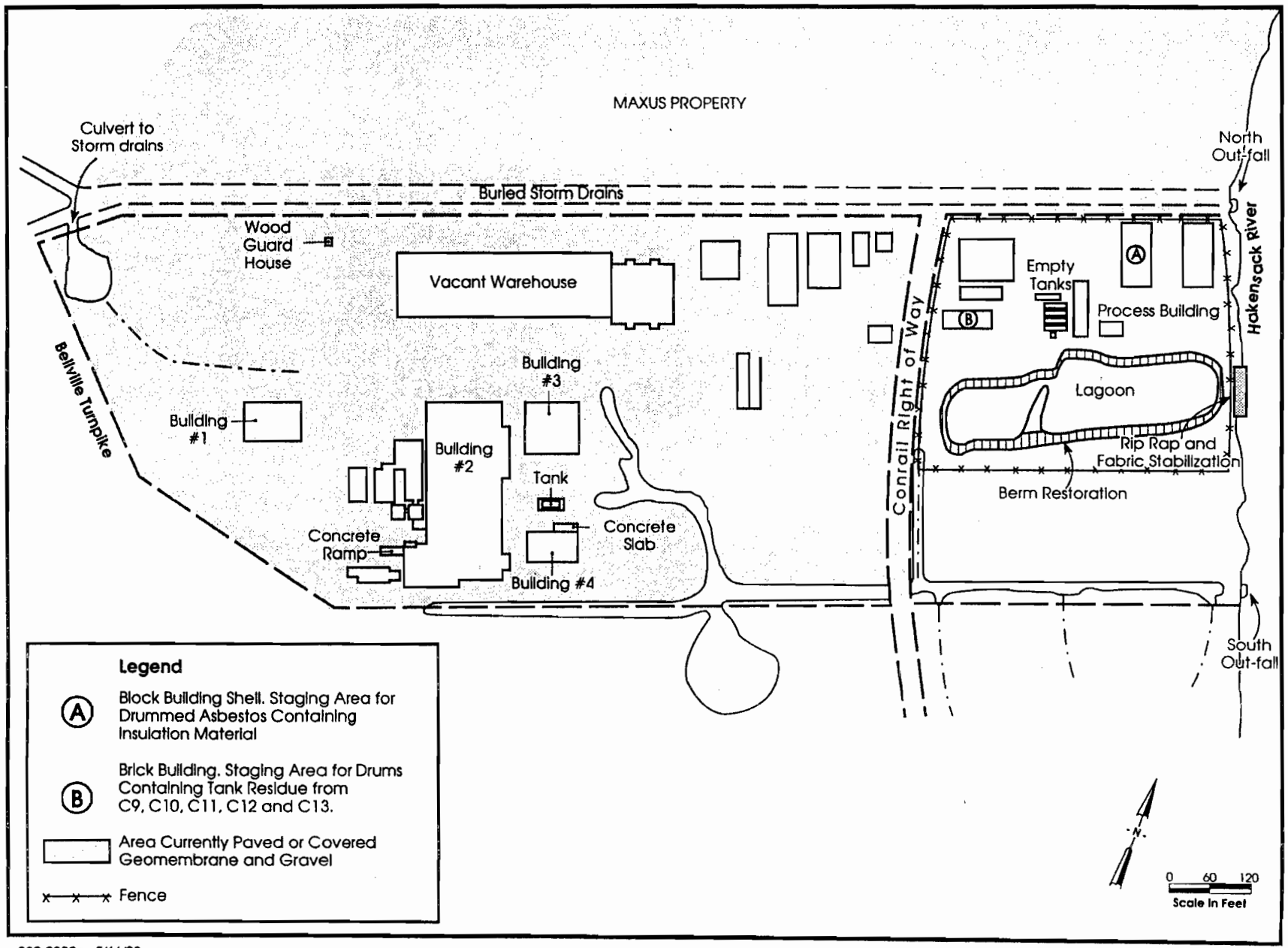

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FIGURE 3-1 INTERIM REMEDIAL MEASURES STANDARD CHLORINE, KEARNY, NJ

3.1.2 Berm Stabilization For The Lagoon

The eastern end of the lagoon is located approximately 50 ft from the Hackensack shoreline (Figure 3-1), separated from the shore by a berm which runs parallel to the shoreline across the property. The berm is generally uncontrolled hard fill. Although there were some erosion problems on the shoreline, historically the shore erosion has not threatened the lagoon nor has stormwater caused the lagoon to overflow. Nevertheless, in order to further ensure that an accidental release from the lagoon would not occur, the low earthen berm around the lagoon was dressed to remove extraneous scrap wood and metal debris and the berm built up to provide a minimum of 2 ft of freeboard in all areas. In addition, approximately 50 ft along the shoreline berm along the portion of the Hackensack adjacent to the lagoon were stabilized using geotextile covered with stone rip rap (d_{50}= 6 inches).

3.1.3 Aboveground Storage Tanks

Five 10,000-gallon steel tanks, numbered C-9, C-10, C-11, C-12, and C-13, remain on concrete cradles adjacent to the west side of the distillation tower (Figure 3-1). The tanks were partially filled with product, mostly in solidified form. The tanks were visually inspected and found to be in good structural condition and free of leaks. Tanks C-9 and C-13 contained mostly rust scale residues. Tanks C-10 and C-12 contained solidified trichlorobenzene residues. Tank C-11 contained some liquid sludge. Two tanks had uncovered access manholes that allowed rainwater to enter the tanks.

The IRM Work Plan originally called for sealing the open manholes and conducting regular visual inspections of the tanks. However, SCCC made the decision to remove the tank contents and place them into new 55-gallon steel drums. The tanks were subsequently thoroughly cleaned out, including chemical solids and residual scale. Very little liquid was present. One end of each tank was cut open to expedite cleaning and to permanently remove the tanks from service. The materials were staged in a secured brick

building which is near the tanks and within the secured area (Figure 3-1). The 106 drums were grouped and labelled according to their tank origin and staged on pallets. Composite samples were taken from several drums in each group by WESTON with NJDEPE present on 6 December 1990 for full TCL analysis. The contents were primarily trichlorobenzenes (7-50 percent) with lesser amounts of dichlorobenzenes. Two samples contained monochlorobenzene and one sample contained benzene. Small amounts of metals (0.1-0.2 percent), including antimony, arsenic, chromium, copper, nickel, lead, and zinc were also present in the tank product. The sampling results are summarized with the results of the RI sampling in Section 5. Based on the results of the sampling, the drums were labelled with DOT stickers and an attached list of waste types.

3.1.4 Asbestos-Containing Material Repackaging

On 3 October 1991, SCCC notified the NJDEPE that dioxin-contaminated asbestos-containing insulating materials previously removed from the distillation building currently stored in bags on site would be re-packaged in PVC drums and remain on site. Shortly thereafter, the material was placed in approximately 400 drums. Seven plastic bags remained which contained oversize pieces of insulating material. The material remains in its original location: a block building with a concrete floor near the old distillation building (Figure 3-1).

3.2 INTERIM REMEDIAL MEASURES INITIATED BY MAXUS

An IRM was also implemented by Maxus Energy Corporation on SCCC's property to mitigate risks of human exposure to the chromium ore residue covering most the property. This activity was performed by Maxus on behalf of their subsidiary, Occidental Chemical Corporation (OCC), that owns the former Diamond Shamrock property north of SCCC which is the source of the chromium residue which was used as backfill.

Work was performed under an Administrative Consent Order between OCC and the NJDEPE signed 17 April 1990. Immediate implementation was delayed until the initial RI was completed. In February 1991, Maxus implemented an IRM which included:

- Asphalt paving of all traffic areas.

- Capping non-traffic areas east of the railroad right-of-way with geotextile overlain with a layer of gravel.

- Dust fence barrier along the railroad right-of-way to isolate the old process area. As noted above, this area is completely secured and only entered as part of the RI.

Figure 3-1 illustrates the areas covered in the chromium IRM. Maxus periodically inspects and maintains these areas. During the supplemental RI investigation, portions of the asphalt cap was removed adjacent to Building 2 to allow soil borings to be completed. Maxus restored these areas after the work was completed.

SECTION 4
REMEDIAL INVESTIGATION SCOPE OF WORK AND METHODOLOGIES

In accordance with the requirements of the Administrative Order, Section IIB and Appendix A, SCCC submitted a draft Remedial Investigation (RI) Work Plan to the NJDEPE in January 1990. After review and comment by the NJDEPE, a final Work Plan was submitted in September 1990 which incorporated DEPE's comments. Final DEPE approval was issued on 26 October 1990.

Based upon the site background information, selected study areas were identified in the RI Work Plan. These included known or suspected contaminant source areas and the shallow groundwater and surface drainage at the site. Specifically these areas of investigation were:

- Complete the characterization of the waste lagoons' contents.
- Characterize existing tanks and soils in the area around the old distillation building.
- Extent of impacts to groundwater and surface water.
- Establish the distribution and depth of the chromium slag/fill.
- Possible contribution of septic system tanks to subsurface contamination.
- Soils and groundwater quality in the former chemical unloading areas.

The field activities were initiated in December 1990 and continued through January 1991. After receipt of the analytical results in April, WESTON reviewed and tabulated the site

data. Summary tables were submitted to NJDEPE in June and a meeting was held between SCCC, WESTON, and DEPE in July 1991 to discuss the results and identify data gaps to be addressed before the preparation of the RI report. As a result of that meeting, a supplementary work plan was submitted to DEPE in August 1991. During the end of 1991 and during the first half of 1992, there was a temporary hiatus in the RI activity while DEPE and Maxus addressed Interim Measures for the chromium waste (see Subsection 3.2). Discussions on the RI resumed in July 1992. A final revised Supplemental Work Plan was submitted to NJDEPE in August 1992 which addressed the following areas of investigation:

- Collection of additional data to quantify the flux of groundwater and chemical constituents to surface water, including the drainage ditch on the south boundary of the site and the Hackensack River to the east.

- Additional subsurface soil sampling in former product storage areas adjacent to Building 2.

- Characterization of out-of-service septic tank contents to evaluate them as potential source areas.

The scope of work presented in this section addresses the chemical and physical characterization of these areas. The field program was completed in two phases which are described in the following subsections.

4.1 PHASE I ACTIVITIES - 1991

Phase I of the Remedial Investigation at the SCCC Kearny site included the following tasks:

- Task 1 - Development of a site map.
- Task 2 - Site reconnaissance.
- Task 3 - Monitor well installation.
- Task 4 - Groundwater sampling.
- Task 5 - Physical characterization of the water-bearing zone.
- Task 6 - Test pit excavation.
- Task 7 - Lagoon sampling.
- Task 8 - Sampling the drummed tank contents.
- Task 9 - Wipe sampling of the distillation building.
- Task 10 - Drainage swale sediment and surface water sampling.
- Task 11 - Soil sampling in the former tank area adjacent to the former distillation building.
- Task 12 - Transformer area sediment sample.

A breakdown of the number of samples collected, locations of the proposed monitor wells, and parameters analyzed is included in Table 4-1. The field work was conducted in accordance with the site-specific health and safety plan (HASP) that had been developed for the SCCC RI. All laboratory analyses were performed by ETC Inc., a New Jersey certified laboratory.

4.1.1 Aerial Survey and Topographic Map

An overflight of the SCCC site and vicinity was completed by the Chester Partnership Surveyors on behalf of Maxus to develop an accurate base map of the area for the chromium IRM activity. The new topographic map at 2-ft contour intervals included all

Table 4-1

Phase I Field and Sampling Program
SCCC, Kearny, NJ

Sample Type	Matrix	Number	Laboratory Parameters							Physical Parameters
			TCL VOC	TCL BNA	TCL Pest/PCB	TAL Metals	Cr^{+6}	Total Chromium	2,3,7,8-TCDD	
Boundary Wells	GW	9 lower	X	X	X	X	X			
Lagoon-Tank Wells	GW	4 lower 4 upper	X X	X X	X X	X X	X X		X X	
Septic-Tank Well	GW	1 lower	X	X	X	X	X			
Manufacturing Building Wells	GW	1 lower 1 upper	X X	X X	X X	X X	X X			
Test Pits	S	8						X		
Lagoon Core Samples	SD	2 W. Lagoon 2 E. Lagoon	X X	X X	X X	X X				X X
Lagoon Water	SW	2	X	X	X	X			X	
Wipe Sampling	D	4							X	
Tank Sampling	L	5	X	X	X	X				
MW-21 Split Spoon	S	1	X	X	X	X				
Tank Area Soils	S	10	X	X						
Swale Sediment Samples	SD	7	X	X	X	X				
Swale Surface Water Samples	SW	5	X	X	X	X				
Transformer Area	SD	1			X					

Note: GW = Groundwater
S = Soil
SW = Surface water
SD = Sediment
D = Dust
L = Liquid

STAN-CL2\TBL4-1.TBL

areas of the site that were investigated in this RI. Maxus provided SCCC with blueprint quality prints as a courtesy. This map was used as a basis for the report maps which were electronically digitized from the blue prints.

The top of casing elevation and location of each monitor well was surveyed for vertical and horizontal control by Ludgate Engineers Inc., a New Jersey licensed surveyor. The monitor wells and sampling locations were plotted on the new site map.

4.1.2 Site Reconnaissance

After initial discussions on the draft RI Work Plan (January 1990), representatives of SCCC, WESTON, and NJDEPE visited the site to identify locations for monitor wells and sampling points.

4.1.3 Soil Boring and Monitor Well Installation

Twenty monitor wells were installed during the RI in December 1990. Because of their age and uncertain condition, the 2-inch monitor wells installed in 1983 were not used in this investigation. Fifteen new wells were screened in the sand overlying the clay (L wells) and five wells were screened in the chromium slag/sand fill (U wells overlying the meadow mat). The locations of the wells are on Figure 4-1. The monitor wells installed include:

- Nine wells located along the site boundary designated MW-1L, and MW-3L through MW-10L. The boundaries and a list of the monitor wells by boundary are provided below:

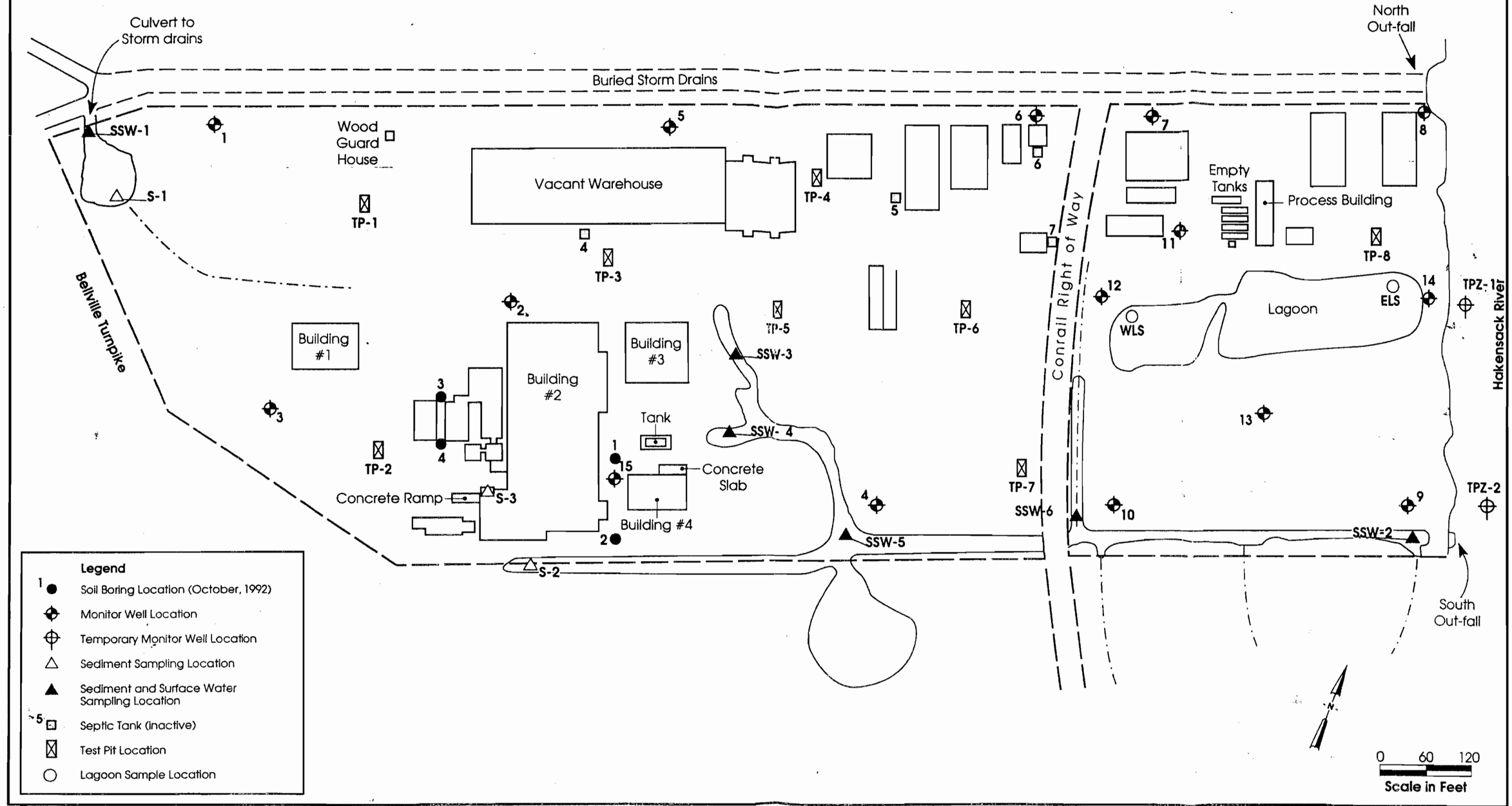

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FIGURE 4-1
REMEDIAL INVESTIGATION SAMPLING LOCATIONS, STANDARD CHLORINE, KEARNY, NJ

Boundary	Monitor Wells
Western	MW-1L, MW-3L
Northern	MW-1L, MW-5L, MW-6L, MW-7L, MW-8L
Eastern (Hackensack River)	MW-8L, MW-14L, MW-9L
Southern	MW-9L, MW-10L, MW-4L, MW-3L

- MW-2L was installed adjacent to the facility's current septic tank. The split spoon soil sample taken at the approximate elevation of the septic tank bottom (5 to 6 ft below ground surface) was analyzed for the parameters designated on Table 4-1.

- Four upper/lower well pairs (eight wells) were installed adjacent to the process area, tanks and lagoons which are potential sources. These wells are designated MW-11L, MW-11U, MW-12L, MW-12U, MW-13L, MW-13U, MW-14L, and MW-14U.

- One upper/lower well pair (MW-15L, MW-15U) located near the former dichlorobenzene manufacturing building, currently the packaging plant.

The monitor wells were installed using hollow-stem auger methods with continuous split-spoon sampling All drilling was performed by James A. Anderson Associates, a New Jersey-licensed well drilling contractor. Well installations were supervised by a WESTON geologist. A description of the cuttings, split-spoon samples and well construction details were logged in the field notebook. The wells were constructed in accordance with NJDEPE specifications. Decontamination procedures used are presented in Table 4-2. The monitor wells were developed by pumping with a submersible pump for an hour or until the discharge water was clear and pH and specific conductance stabilized.

Table 4-2

Decontamination Procedures
SCCC, Kearny, NJ

Drill rig, augers, tools	Steam clean
Water level probe split spoons (for descriptive purposes)	Potable water and alconox scrub Potable water rinse Deionized water rinse
Stainless steel submersible pumps	Alconox and potable water scrub (and purge for pumps) Thorough potable water rinse (and purge for pumps) Deionized water rinse
Teflon sampling bailers and leader, stainless steel bowls, scoops, hand augers; split spoons (for analysis purposes)	Alconox and potable water scrub Potable water rinse Deionized water rinse 10% nitric acid rinse Deionized water rinse Acetone (pesticide grade) rinse Total air dry Deionized water rinse

Note: All rope and tubing used were dedicated to each well and made of polyethylene.

The lower wells were completed in the natural sand with the sand pack ending and the bentonite seal beginning at or below the meadow mat. The shallow wells were completed in the chromium slag/fill approximately 1 ft above the meadow mat.

4.1.4 Groundwater Sampling

During the week of 10-14 January 1991, all wells were sampled for Target Compound List (TCL) volatile and semi-volatile organic compounds, pesticides, PCBs, and inorganics. Analyses for hexavalent chromium was also done, since this form of chrome is found in the chromium waste and is more mobile than the trivalent form. In addition, groundwater samples from the three wells adjacent to the lagoon were analyzed for 2,3,7,8-TCDD.

Wells were sampled according to NJDEPE guidelines (NJDEPE, 1988, 1992). This included a check for immiscible liquids, pre-sampling, purging, and collection of general field parameters data (pH, temperature, and specific conductance). The samples were analyzed as designated on Table 4-1. Sample bottle size and type, analytical methodology, and QA/QC sample amounts are designated on Table 4-3.

4.1.5 Water Level Elevations

A full round of water level readings were taken at the monitor wells on 14 January and 31 January 1991 to develop piezometric maps of groundwater gradient and direction of flow. Groundwater levels were also measured prior to sampling each well.

4.1.6 Test Pits

Eight test pits were completed in areas around the site where subsurface information was lacking. Their locations are shown on Figure 4-1. The purpose of the test pits was to establish the depth of chromium slag fill in the substratum by visual inspection and to

Table 4-3

Phase I Groundwater Sampling Summary
SCCC, Kearny, NJ

Parameter	Bottle		Preservative	Analytical Methodology	Investigative Samples	QA/QC Samples Field			Lab MS, MSD	Total Samples
	Size	Type				DUP	FB[1]	TB[1]		
TCL VOC	40 mL	SV[2]	4°C, no headspace	8240, SW846	20	2	3	2	1,1	29
TCL BNA	1L	AG[3]	4°C	8270, SW846	20	2	3		1,1	27
TCL Pest/PCB	1L	AG[3]	4°C	8880, SW846	20	2	3		1,1	27
TAL Metals	1L	P[4]	HNO_3 to pH<2	SW846 methods	20	2	3		1,1	27
Cr^{+6}	400mL	P[4]	4°C	312B, standard methods	20	2	3		1,1	27
2,3,7,8-TCDD	1L	AG[3]	4°C	modified 8280 only 2,3,7,8-TCDD	8	1	1		1,1	12

[1] TB = Trip blank, one TB per two field days, analysis for VOCs only.
[1] FB = Field blank, performed at a rate of one per day per sample matrix.
1 = FB + TB water originates from the laboratory and is the same as the method blank water. Blank water is received in the field within one day of preparation. Blank water is used within two days of receipt.
[2] SV = Teflon septum vial.
[3] AG = Amber glass bottle.
[4] P = Polyethylene bottle.

sample the underlying material for chromium analysis. The results of the test pits evaluation were used along with the soil boring results to characterize the vertical and horizontal extent of the chromium slag underlying the site.

The test pits were excavated by a backhoe. The backhoe arrived on the site in clean condition. Prior to excavating and between test pits the backhoe bucket and arm were subjected to steam cleaning. The operator was directed to excavate until the WESTON geologist indicated that the bottom of the chromium slag fill had been identified. When the test pit was less than 3 ft, the sampler entered the pit and collected a sample of the soil underlying the chromium slag fill. When the pit was deeper, the sample was collected from the bucket in an area where the soil was not in contact with the bucket. A decontaminated trowel was utilized to transfer the sample into a labeled glass sample jar. The samples were analyzed for total chromium (Table 4-1). During excavation, all material was placed on a tarp. Material was placed back into the excavation after sampling was completed.

4.1.7 Lagoon Sampling

Previous investigations in 1987 characterized the physical nature of the lagoon contents and samples were analyzed for dioxin compounds. Additional sampling of the lagoon was completed in order to complete the waste characterization and obtain information required for the review of possible remedial action alternatives.

Two samples were collected near the previous inflow areas, one in the northwest corner of the east lagoon, and one in the northeast corner of the west lagoon. During the RI, these areas were not under water. Samples in the west lagoon were collected using a hand auger. The east lagoon sample was obtained using a backhoe.

Samples were analyzed from the two physically distinct layers encountered in the lagoon. The upper layer consists of white to brown bladed crystals mixed with variable portions

of silt and sand. The lower layer is a soft to hard black tar which overlies the natural meadow mat. Discrete samples of each material were collected by WESTON. In addition to the sludge samples, one surface water sample was collected in each lagoon. The sludge and water samples were analyzed for the parameters listed in Table 4-1. The analytical methodology, sample bottle size and type, and QA/QC procedures are listed in Table 4-4 (sediments).

4.1.8 Tank Sampling

As discussed in Subsection 3.1.3, the IRM activity included removing the material in the storage tanks adjacent to the distillation building and containerizing it in 55-gallon steel drums. These drums are staged in a brick building in the secured area near the tanks (Figure 3-1). The drums are arranged on pallets according to the tank from which the material originated. On 13 December 1991, WESTON obtained grab samples of contents from several drums within each group. The samples from each group were composited and submitted for analysis. Samples included solids from tanks C-10, C-11, C-12, and C-13, and a sludge from C-11 (sample CC11L); C-9 consisted of tank scale residue and was not sampled. A DEPE representative was present during the sampling.

4.1.9 Wipe Sampling of the Process Building

The results of a single wipe sample (WS-1) collected in 1987 within the dichlorobenzene process building (WESTON, 1987) indicated the presence of dioxins. In order to confirm these results, four additional wipe samples were collected in the dichlorobenzene process building. One of these samples was collected on the distillation vessel directly adjacent to where WS-1 was collected. The exact location of the three other wipe samples was determined in the field. The wipe samples were analyzed for 2,3,7,8-TCDD only (Table 4-1). The samples were collected in accordance with NJDEPE specifications. The laboratory results from the wipe samples were not valid due to organic interference.

Table 4-4

Phase I Surface Water, Sediment and Soil Sampling Summary
SCCC, Kearny, NJ

Parameter	Bottle		Preservative	Analytical Methodology	Investigative Samples	QA/QC Samples Field			Lab MS, MSD	Total Samples
	Size	Type				DUP	FB[1]	TB[1]		
Surface Water (Lagoon and Swales)										
TCL VOC	40 mL	SV[2]	4°C, no headspace	8240, SW846	7	1	1	1	1,1	12
TCL BNA	1L	AG[3]	4°C	8270, SW846	7	1	1		1,1	11
TCL Pest/PCB	1L	AG[3]	4°C	8880, SW846	7	1	1		1,1	11
TAL Metals	1L	P[4]	HNO_3 to pH<2	SW846 methods	7	1	1		1,1	11
Sediment and Soil (Tank Area, Swale, Transformer and Lagoon Sediment)										
TCL VOC	120 mL	wide mouth G[5]	4°C	8240, SW846	22	3	1		1,1	12
TCL BNA	80 mL	wide mouth G[5]	4°C	8270, SW846	22	3	2		1,1	23
TCL Pest/PCB	80 mL	wide mouth G[5]	4°C	8880, SW846	13	2	1		1,1	5
TAL Metals	80 mL	wide mouth G[5]	4°C	SW846 Methods	12	2	1		1,1	11

[1] FB = See Table 4-3.
[1] TB = See Table 4-3.
[2] SV = Teflon septum vial.
[3] AG = Amber glass bottle.
[4] P = Polyethylene bottle.
[5] G = Glass polypropylene cap.
* To prevent loss of volatiles sample should not be homogenized.
Note: All sediment and soil samples included except for test pit samples.
Additional samples will be required if the drainage swale sampling extends beyond one day or the tank area sampling extends beyond two days.

4.1.10 Drainage Swale Sediment and Surface Water Sampling

Five surface water samples (SSW-1 through SSW-5) and seven sediment samples (including S-1 and S-2) were collected from the drainage ditches located on the site (see Figure 4-1). One surface water (SW-1) and two sediment samples (SSW-1 and S-1) were taken in the drainage depression at the northwest corner of the site. This area discharges to the storm drain that runs along the northern property border to the Hackensack River. SSW-1 was located in an area of ponded water next to the discharge pipe. S-1 was taken at the opposite end of the depression which is usually not submerged. Sediment and surface samples SSW-3, SSW-4, and SSW-5 were taken in the drainage ditch which carries the facility's NPDES discharge. Locations 3 and 4 were near the head of the two ditch branches (3 is near the NPDES outfall) and location 5 is at the confluence of the on-site ditch and the ditch along the southern site boundary. Sediment sample S-2 was located upstream of sample location 5 in the south boundary ditch. This portion of the ditch is usually dry except during precipitation events. Water and sediment samples SSW-2 were taken at the depression where the ditch meets the culvert to the Hackensack River. Because of the tide gate on the culvert, water from the Hackensack does not enter the culvert and the water present is drainage from the SCCC property, Koppers property to the south and adjacent areas.

Since the water in the ditches was shallow and flow sluggish, a stainless steel trowel was utilized to collect the sediment samples. Each sample was described according to texture, color, grain size distribution and other pertinent information. A grab sample for VOC analysis was put directly in a laboratory-prepared labeled jar. The remaining sample was mixed in a clean stainless steel bowl and an aliquot was selected for analysis of the remaining TCL analytes. The surface water samples were collected in the sample bottles at mid-depth in the streams.

The sediment and surface water samples were analyzed for the parameters designated in Table 4-1. Bottle size and type, analytical methodology and QA/QC samples are

designated in Table 4-4. All sampling equipment was decontaminated as described in Table 4-2.

4.1.11 Tank Area Soil Sampling

A total of ten shallow soil samples were collected in areas around the former storage tanks adjacent to the distillation building (see Figure 4-1) Samples were analyzed for VOCs and BNAs. The soil sampling was performed according to the following procedures:

- Samples were located near the ends of existing tanks near valves and joints. In areas where tanks are no longer present, samples were taken next to the concrete cradles. Because of very wet conditions during the time of sampling, soil vapor screening could not be done.

- The soil samples were obtained from a depth of approximately 1 to 2 ft by using a hand-held bucket auger. Soil was removed from the auger and placed in a stainless steel bowl using a clean stainless steel spatula.

- Each sample jar was labeled, sealed in a plastic bag, and placed in a cooler.

- QA/QC methodology and protocol are listed in Table 4-4.

- Decontamination procedures were followed as described in Table 4-2.

4.1.12 Transformer Area Sediment Sample

One sediment sample was collected from the transformer pad drainage area. The exact

location of the sample was confirmed and approved by an NJDEPE representative in the field. The sample was collected with a decontaminated trowel and placed in the appropriate sample container. Following collection, the sample jar was labeled, sealed in a plastic bag and placed in a cooler. The sample was analyzed for PCBs (Table 4-1).

4.2 PHASE II SUPPLEMENTAL RI ACTIVITIES - 1992

After completion of Phase I of the RI, NJDEPE requested that additional data be collected at the site. The emphasis of the additional work was to identify possible source areas adjacent to Building 2 to confirm previous groundwater quality data, to characterize the out-of-service septic tank contents, to collect additional hydrologic data, and to fill in some location gaps in the surface drainage data. A supplemental work plan summarizing initial results and outlining the additional work was approved by NJDEPE (WESTON, 1992). The scope of work included:

- Continual water level monitoring of select wells to establish tidal variations.
- Slug tests of selected wells to determine hydraulic conductivities of the water-bearing sediments.
- Confirmation round of groundwater sampling on selected wells.
- Installation of temporary well points to obtain bank seepage samples and piezometric levels along the Hackensack River.
- Soil borings in product handling and storage areas.
- Sampling of the contents of four out-of-service septic tanks.

- Surface water and sediment sampling at one ditch location not addressed in the original RI sampling.

The supplemental activities performed for the RI during Phase II are outlined in the following subsections.

4.2.1 Tidal Fluctuations in Groundwater Levels

Using automatic water level recorders, continuous water level readings were collected in monitor wells MW-4, MW-5, MW-9, and MW-14 for 11 days between 25 September and 6 October 1992 during and between flood and neap tide stages. Water levels were recorded by an automatic data logger at two-minute intervals. Data were directly downloaded to a personal computer for evaluation.

Complete rounds of static water levels were also obtained manually with an electronic water probe from all on-site monitor wells during high and low tide conditions. Surface water levels were also taken at these times at staff gauge locations in the drainage ditch. Elevations in the Hackensack River at Kearny Point were established from published tide tables. Although a major rainstorm occurred just before the start of monitoring, no rainfall was recorded during the monitoring period.

4.2.2 Slug Tests

Slug tests were completed on selected existing monitor wells to determine hydraulic conductivity. The hydraulic conductivity (K) is a key parameter for calculating lateral flow velocity and volume in the shallow groundwater system. Wells were "slugged" with a cylinder of known mass and volume that was quickly lowered into the well, then quickly removed after the water level had stabilized. A transducer and data logger automatically recorded water level recovery. Monitor wells MW-3, MW-4, MW-5, MW-

6, MW-8, MW-9, MW-13 and MW-14 were selected for testing to provide data from all areas of the site.

The slug tests were performed according to the following procedures:

- Obtain depth-to-water measurement.
- Install transducer 1 ft above the bottom of the well.
- Connect the transducer to data recorder and calibrate.
- Allow the water to re-equilibrate.
- Lower slug into well just above water.
- Activate data logger and smoothly lower slug completely below water.
- Secure slug and run test until water level re-equilibrates.

The Bouwer and Rice Method (1976) was used to analyze the slug test data.

4.2.3 Supplementary Groundwater Sampling and Well Point Installation

Groundwater samples were collected from monitor wells MW-2, MW-3, MW-4, MW-5, MW-8, MW-9, MW-10, MW-14L, and MW-15. Samples were analyzed for volatile and semivolatile organics plus chromium and lead. Quality control samples were taken as required, including trip blanks, field blanks, duplicates and MS/MSD. Groundwater samples were taken according to procedures used in the January 1991 sampling effort outlined in Subsection 4.1.1.

As part of the groundwater sampling, two well points were installed in the river bank to directly sample seepage to the river and measure water levels. The actual locations were determined after a field inspection of the river bank at low tide by a hydrogeologist from WESTON. One well point was placed opposite the lagoon and MW-14; a second was

opposite MW-9 (see Figure 4-1). The well points were constructed of 2-inch diameter PVC with 2-ft of 10-slot screen. The borehole was drilled to approximately 3 ft by hand auger. A sand pack was placed in the annulus and the surface sealed with bentonite pellets.

The points were sampled after purging three volumes with a bailer. Casing elevations were also surveyed for elevation. The points were removed at the end of the groundwater monitoring program.

4.2.4 Soil Borings Adjacent to Building 2

One soil boring was completed on the east side of Building 2 near MW-15 and two additional borings were completed to the west of Building 2 where in the past above ground storage tanks were located and chemicals for production or shipment were loaded. Locations are shown on Figure 4-1. Continuous split-spoon samples were obtained from each boring. The purpose of the borings was to obtain continuous lithologic samples down to the top of the clay for visual inspection for free product, and field screening for organic vapors. Two samples from each boring were submitted for laboratory analysis; one from the shallow unsaturated zone and one from the sandy sediments just above the clay horizon.

4.2.5 Septic Tanks

There are currently a number of buried in-service and out-of-service septic tanks on the SCCC property. There are no underground product or fuel storage tanks. Septic tank construction is either masonry or concrete. The location of the tanks is shown in Figure 4-1. According to current information, tanks numbered 1, 2, and 3 are in service, while the remaining tanks (numbered 4 through 7) have been out of service for some time, but were never formally closed. Tanks 3, 4, 6 and 7 are readily accessible through steel covers.

Water and sludge samples were obtained from Tanks 4 and 5. Only water samples were obtained from tanks 6 and 7 neither of which contained significant amounts of solids. The tank samples were analyzed for VOCs, BNAs, pesticide PCBs, metals, and also waste characterization parameters.

4.2.6 Surface Water and Sediment Sampling

Additional samples of surface water and sediment (SSW-6) were taken in the drainage ditch adjacent to the railroad right-of-way just before the ditch enters the east-west drainage ditch on the southern boundary of the site (Figure 4-1). The samples were analyzed for the full EPA organic and inorganic target compound list (TCL). Procedures were the same as those used to collect surface water and sediment samples in the initial RI (Subsection 4.1.10).

SECTION 5
RESULTS OF THE REMEDIAL INVESTIGATION

5.1 INTRODUCTION

5.1.1 Organization

This section discusses the results of the Remedial Investigation and previous site investigations, including the presence of contamination, sources, affected media, pathways of migration and potential off-site receptors. The discussion of results is organized by the following groupings:

- Potential Primary Source Areas which include the chromium waste fill, lagoons, aboveground product storage tanks (since removed), and septic tanks.

- Potential Secondary Source Areas which include the soils around the old distillation building and adjacent to Building 2 in the former production and product storage and handling areas.

- Impacted Pathways which include the groundwater and surface drainage at the site.

5.1.2 Analytical Results QA/QC Issues

Many samples analyzed during the RI were waste product or were soils or water containing high concentration of chemicals of concern. The analytical methods specified for this investigation were standard methods for remedial investigations and were designed for detection of compounds at trace levels in the matrix. Consequently, high

dilution was required for many samples resulting in high detection limits. Additionally, the reporting of results on a dry weight basis after oven drying the sample distorts results when high percentages of volatile organic compounds are present. (This error is not significant at trace concentrations.) Although in samples with high concentrations of chemicals the reported results are quantitatively not precise, they do not affect the fundamental conclusions of the RI.

Based on SCCC's experience with characterization of waste materials at other facilities, analysis for PCB compounds by Method 8880 in samples containing high concentrations of dichlorobenzenes may produce false positive results. PCBs were reported in two septic tank solids samples and in drummed chlorobenzene waste materials. However, PCBs were found at levels of concern in only one environmental sample: a sediment sample from an adjacent transformer pad. SCCC and DEPE chemists are currently discussing alternative analytical methods. The resolution of this issue will affect only a limited part of the FS.

5.2 POTENTIAL SOURCE AREAS

During the course of the remedial investigation, three potential source areas of contaminants were identified: the lagoons, aboveground product storage tanks and septic tanks. Of these, only the septic tanks and lagoons remain. There are no current site production activities, and most of the original sources such as product storage tanks and piping have been removed. The remaining product tanks were cleaned out in 1990 as an interim remedial measure.

5.2.1 Waste Lagoons

5.2.1.1 Physical Description of the Waste Lagoons

Because they represent a large volume of waste product and are in direct contact with the

subsurface, the lagoons are the most significant current source of contaminants. Assuming a combined area of 33,000 sq ft and average depth of 6 ft, the lagoons contain approximately 198,000 cubic ft of waste material. In 1987, an investigation was conducted of the lagoon waste for the purpose of characterizing the distribution of dioxin compound 2,3,7,8-TCDD. Nineteen cores were completed in the lagoons.

The results of this investigation were originally presented in the Stage I Analysis Report (WESTON, 1987) and were summarized in Subsection 1.3.4 of this RI Report. The log descriptions of these cores were used to develop cross sections. Physically, the lagoons consist of two major layers of material: 1-3 ft of white to brown material with bladed crystals, silt and fine sand. The lower layer consisted of 3-4 ft of black tar material, soft to hard. Wood and brick debris is mixed with the waste. The waste rests directly on the meadow mat, and the sides of the depression are chromium fill.

The base of the waste material is in contact with the water table. Presently, the lagoon surface is only partially submerged. The high permeability of the surrounding fill material evidently disperses drainage. The lagoon does not overfill during storm events and historically overtopping of the lagoons has not been a problem. IRMs (Section 3) were completed in 1990 to stabilize the Hackensack River shoreline opposite the lagoons and provide a minimum 2-ft freeboard around the lagoons.

5.2.1.2 Chemical Characterization of Lagoon Waste

During the RI, sludge samples were collected in the lagoons from each of the two physically distinct layers: the upper light-colored silty material with bladed crystals, and the lower black tar-like material. Two sludge samples and one water sample were collected from each lagoon Figure 5-1). The samples were analyzed for TCL VOCs and BNAs, and TAL metals, cyanide, phenolics, and RCRA characteristics (sludge only).

The results of the lagoon sludge analysis (Table 5-1) indicate:

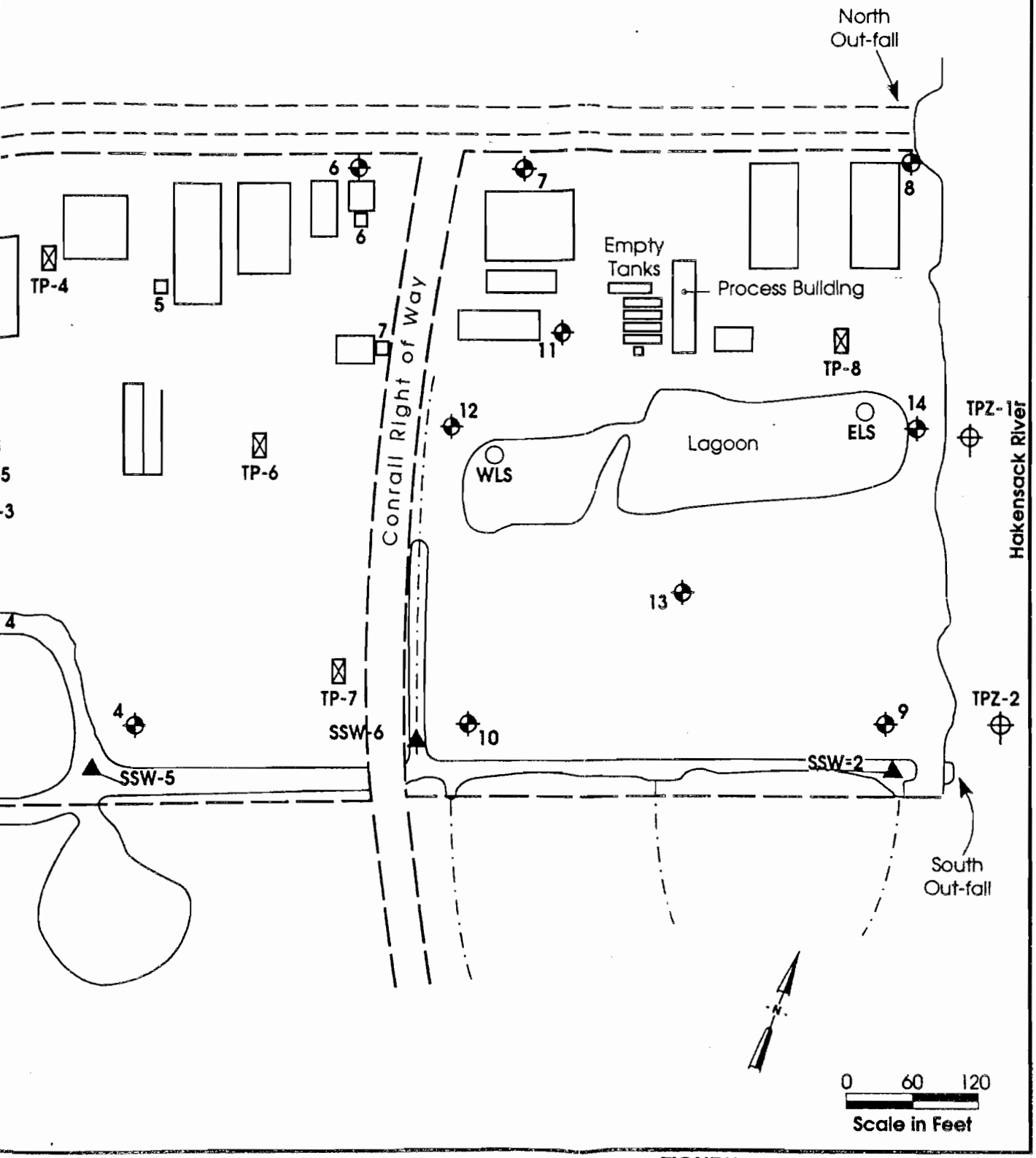


FIGURE 5-1
REMEDIAL INVESTIGATION SAMPLING LOCATIONS, STANDARD CHLORINE, KEARNY, NJ

TABLE 5-1
SUMMARY OF LAGOON SAMPLING DATA
VOLATILES AND SEMIVOLATILES
SCCC, KEARNY, NJ

LAB NUMBER	HA3591		HA3592		HA3593		HA3594		HA3597		HA3598	
SAMPLE NUMBER	WLS-1		WLS-2		ELS-1		ELS-2		WLS-1		ELS-1	
MEDIUM	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		WATER		WATER	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
VOC Compound (ug/kg)									(ug/L)			
Benzene	**ND**	15000	**BMDL**	4100	**896**	670	**23400**	6700	**ND**	4.4	**ND**	22.0
Chlorobenzene	**ND**	20000	**ND**	5600	**ND**	910	**ND**	9100	**BMDL**	6.0	**77.6**	30.0
Ethylbenzene	**39600**	24000	**15200**	6700	**2580**	1100	**43300**	11000	**ND**	7.2	**ND**	36.0
Methylene Chloride	**21500**	9300	**6090**	2600	**438**	420	**5330**	4200	**ND**	2.8	**ND**	14.0
Toluene	**33800**	20000	**15300**	5600	**3050**	910	**63100**	9100	**ND**	6.0	**BMDL**	30.0
BNA Compound (ug/kg)									(ug/L)			
Acenaphthene	**6070000**	130000	**2090000**	170000	**529000**	5800	**3650000**	290000	**ND**	1.9	**BMDL**	1.9
Anthracene	**1700000**	130000	**190000**	170000	**180000**	5800	**BMDL**	290000	**ND**	3.6	**ND**	1.9
Benzo(a)anthracene	**BMDL**	520000	**ND**	720000	**ND**	24000	**ND**	1200000	**ND**	8.0	**ND**	8.0
Benzo(b)fluoranthene	**BMDL**	320000	**ND**	440000	**ND**	15000	**ND**	730000	**ND**	4.9	**ND**	4.9
1,2-Dichlorobenzene	**ND**	130000	**ND**	170000	**22100**	5800	**ND**	290000	**BMDL**	1.9	**1.9**	1.9
1,3-Dichlorobenzene	**ND**	130000	**ND**	170000	**ND**	5800	**ND**	290000	**4.6**	1.9	**10.2**	1.9
1,4-Dichlorobenzene	**ND**	290000	**ND**	400000	**40000**	13000	**ND**	660000	**10.5**	4.5	**23.0**	4.5
Fluoranthene	**903000**	150000	**BMDL**	200000	**115000**	6700	**ND**	330000	**ND**	2.2	**ND**	2.2
Fluorene	**5150000**	130000	**717000**	170000	**587000**	5800	**604000**	290000	**BMDL**	1.9	**ND**	1.9
Hexachlorobenzene	**ND**	130000	**ND**	170000	**93500**	5800	**ND**	290000	**BMDL**	1.9	**ND**	1.9
Naphthalene	**2040000000**	110000	**300000000**	150000	**815000000**	4800	**25200000000**	240000	**12.7**	1.6	**3.1**	1.6
Phenanthrene	**5320000**	360000	**628000**	500000	**715000**	16000	**BMDL**	820000	**BMDL**	5.5	**BMDL**	5.5
1,2,4-Trichlorobenzene	**ND**	130000	**ND**	170000	**ND**	5800	**ND**	290000	**7.1**	1.9	**18.5**	1.9
Pyrene	**663000**	130000	**ND**	170000	**32200**	5800	**ND**	290000	**ND**	1.9	**ND**	1.9
2,4-Dimethylphenol	**21900000**	180000	**2770000**	250000	**17600000**	8200	**3490000**	410000	**11.1**	2.8	**154.0**	2.8
Phenol	**1210000**	100000	**12100000**	140000	**4220000**	4500	**14100000**	230000	**74.3**	1.5	**24.2**	1.5
Phenolics	**31.5**	10.73	**9.6**	2.98	**12.6**	4.88	**1.29**	0.48	**0.15**	0.05	**1.12**	0.05

ND – Not detected
BMDL – Present below detection limit, estimated concentration not reported by laboratory

STAN – CL2\LAGSMPL.WK3

TABLE 5-1 (Continued)
SUMMARY OF LAGOON SAMPLING DATA
METALS
SCCC, KEARNY, NJ

LAB NUMBER	HA3591		HA3592		HA3593		HA3594		HA3597		HA3598	
SAMPLE NUMBER	WLS-1		WLS-2		ELS-1		ELS-2		WLS-1		ELS-1	
MEDIUM	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		WATER		WATER	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
Metals (mg/kg)									(mg/L)			
Antimony	ND	39.00	BMDL	11.00	BMDL	19.00	19.00	18.00	ND	0.0600	BMDL	0.0600
Arsenic	BMDL	33.00	BMDL	9.50	BMDL	3.10	5.10	3.00	ND	0.0100	BMDL	0.0100
Beryllium	ND	0.66	ND	0.19	ND	0.31	ND	0.30	ND	0.0010	ND	0.0010
Cadmium	BMDL	1.30	0.39	0.37	ND	0.62	BMDL	0.61	ND	0.0020	ND	0.0020
Chromium	200	6.60	521.00	1.90	767.00	3.10	2080.00	3.00	0.30	0.0100	2.8400	0.0100
Copper	480	6.60	66.00	1.90	200.00	3.10	64.00	3.00	ND	0.0100	0.0350	0.0100
Lead	970	49.00	1200.00	14.00	570.00	23.00	4270.00	23.00	BMDL	0.0750	0.3500	0.0750
Mercury	16	0.53	BMDL	0.15	4.50	0.11	3.10	0.24	BMDL	0.0002	0.0017	0.0002
Nickel	130	13.00	41.00	3.70	91.00	6.20	150.00	6.10	BMDL	0.0200	0.0220	0.0200
Selenium	BMDL	3.30	BMDL	0.94	ND	7.50	ND	7.50	ND	0.0050	ND	0.0050
Silver	BMDL	6.60	ND	1.90	ND	3.10	BMDL	3.00	ND	0.0100	ND	0.0100
Thallium	ND	6.60	ND	1.90	ND	16.00	ND	3.00	ND	0.0100	ND	0.0100
Zinc	ND	13.00	20.00	3.70	20.00	6.20	39.00	6.10	0.39	0.0200	0.3700	0.0200
Cyanide	58.70	3.33	98.70	0.93	12.58	1.50	14.30	1.50	ND	0.0250	ND	0.0250

ND – Not detected
BMDL – Present below detection limit, estimated concentration not reported by laboratory

STAN-CL2\LAGSMMET.WK3

- There was no major chemical difference between samples from the upper and lower waste layers. The major constituent in each of the four samples was naphthalene which accounted for between 30 and almost 99 percent of the sample content. Other PAH compounds were also present in lower, but significant concentrations. Pyrene was found in the two upper samples only.

- 2,4-Dimethylphenol and phenol were present in all samples in the percent range.

- VOC compounds, toluene, ethylbenzene, and methylene chloride were detected in all four sludge samples in the part-per-million range. The east lagoon samples also contained benzene.

- Significant levels of chromium, copper, nickel, and lead were detected in the four sludge samples. Cyanide was also detected.

- Dichlorobenzenes were found in one sample, the east lagoon upper sample, and only in minor concentrations.

- PCBs were not detected in any of the samples.

The results of the lagoon surface water analysis (Table 5-1) indicate:

- The only VOCs detected were chlorobenzene and toluene.

- Low concentrations of dichlorobenzenes, naphthalene, 1,2,4-trichlorobenzene, 2,4-dimethylphenol, and phenol were detected.

- Low concentrations of chromium, copper, lead, mercury, and nickel were detected. Cyanide was not detected.

- Phenolics were detected in both water samples.

- Dioxin and PCBs were not detected.

5.2.2 Aboveground Product Storage Tanks

5.2.2.1 Product Storage and Handling

In the past, unintentional releases by leaks or spills from pipes and aboveground product storage tanks represented a source of contamination to soils and groundwater in the former product handling and storage areas. All piping and all but four tanks were removed after operations ceased. The four remaining tanks were cleaned out in 1990. Historical aerial photographs and other evidence indicate the presence of former tank locations and a railroad spur entering the southeast corner of the property behind Building 2 where materials were handled and stored. Tank cradles in the process area north of the lagoons also indicate material storage in that area. Chemical releases could have occurred in these areas by accidental spills or chronic leaks in pipe and valve connections. The analysis of the contents of the only four remaining tanks indicates that they were used to store trichlorobenzene products. However, the process area was historically used for naphthalene product production and this product was stored in this area over a longer period of time.

5.2.2.2 Tank Analytical Results

The former contents from four aboveground tanks were sampled from drums in which the material is currently stored (as discussed in Section 3) and analyzed for VOCs, BNAs, metals, PCBs, cyanide, and phenolics. The results (Table 5-2) indicate:

- The major constituent of the material is 1,2,4-trichlorobenzene with lesser amounts of dichlorobenzenes, hexachlorobenzene, and trichlorophenol.

- Metals were detected at concentrations totaling no more than 0.2 percent of the total mass. They include antimony, arsenic, chromium, copper, nickel, lead, and zinc, with traces of cadmium and mercury.

- Volatile organic compounds, benzene and chlorobenzene, were found in two samples.

- Phenolics were not detected.

- PCB-1242 was detected at concentrations in each sample ranging from 121 to 630 ppm. Ast noted in Subsection 5.1, these results may be false positives due to interference of elevated concentrations of chlorinated solvent compounds.

5.2.3 Septic Tanks

The four out-of-service septic tanks, numbered 4 through 7, were considered a potential source of contamination to surrounding groundwater and soils. Tank locations are shown on Figure 5-1.

TABLE 5-2
SUMMARY OF TANK SEDIMENT ANALYTICAL DATA
VOLATILE AND SEMIVOLATILE ORGANICS
SCCC, KEARNY

LAB NUMBER SAMPLE NUMBER	HA3557 Tank #1		HA3559 Tank #2		HA3560 Tank #3		HA3561 Tank #4		HA3562 Tank #5	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
VOC Compound (ug/kg)										
Benzene	**ND**	4400	**ND**	3200	**ND**	540	**19600**	7000	**ND**	630
Chlorobenzene	**ND**	6000	**86000**	4400	**BMDL**	730	**335000**	9500	**ND**	860
Methylene Chloride	**5920**	2800	**BMDL**	2100	**743**	340	**5190**	4400	**ND**	400
BNA Compound (ug/kg)										
Butyl benzyl phthalate	**BMDL**	100000	**ND**	14000	**ND**	24000	**ND**	16000	**ND**	14000
1,2-Dichlorobenzene	**138000**	19000	**2540000**	2700	**ND**	4600	**3570000**	3000	**48400**	2700
1,3-Dichlorobenzene	**41600**	19000	**210000**	2700	**ND**	4600	**375000**	3000	**3480**	2700
1,4-Dichlorobenzene	**61300**	44000	**557000**	6200	**ND**	11000	**811000**	7000	**12500**	6200
Hexachlorobenzene	**195000**	19000	**73500**	2700	**43900**	4600	**56700**	3000	**54000**	2700
1,2,4-Trichlorobenzene	**465000000**	19000	**225000000**	2700	**70400000**	4600	**160000000**	3000	**47700000**	2700
2,4,6-Trichlorophenol	**ND**	27000	**ND**	3800	**36100**	6600	**73800**	4300	**10400**	3800
Phenolics	**ND**	0.16	**ND**	0.24	**ND**	0.39	**ND**	0.25	**ND**	0.23
PCB's (ug/kg)[1]										
Aroclor-1242	**630000**	360000	**204000**	50000	**121000**	87000	**147000**	57000	**164000**	51000

CONC. – Concentration of Compound
D.L. – Detection Limit
ND – Not Detected
BMDL – Present below detection limit, estimated concentration not reported by laboratory
(1) Laboratory method may detect false positives due to interference of elevated concentrations of chlorinated solvent compounds.

TABLE 5-2 (Continued)
SUMMARY OF TANK SEDIMENT ANALYTICAL DATA
METALS
SCCC, KEARNY

LAB NUMBER SAMPLE NUMBER	HA3557 Tank #1		HA3559 Tank #2		HA3560 Tank #3		HA3561 Tank #4		HA3562 Tank #5	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
Metals (mg/kg)										
Antimony	**6.40**	6.00	**76.00**	8.80	**140.00**	15.00	**180.00**	9.50	**180.00**	8.60
Arsenic	**BMDL**	1.00	**6.10**	1.50	**37.00**	2.50	**12.00**	1.60	**28.00**	1.40
Cadmium	**BMDL**	0.20	**0.75**	0.29	**2.50**	0.49	**1.30**	0.32	**2.90**	0.29
Chromium	**3.60**	1.00	**192.00**	1.50	**324.00**	2.50	**252.00**	1.60	**20.00**	1.40
Copper	**2.80**	1.00	**247.00**	1.50	**517.00**	2.50	**437.00**	1.60	**475.00**	1.40
Lead	**ND**	7.50	**24.00**	11.00	**130.00**	18.00	**43.00**	12.00	**58.00**	11.00
Mercury	**0.12**	0.08	**0.17**	0.12	**24.80**	0.20	**0.33**	0.13	**21.70**	0.11
Nickel	**BMDL**	2.00	**73.00**	2.90	**170.00**	4.90	**100.00**	3.20	**110.00**	2.90
Selenium	**ND**	0.50	**ND**	0.74	**BMDL**	1.20	**ND**	0.79	**ND**	0.72
Silver	**ND**	1.00	**ND**	1.50	**ND**	2.50	**ND**	1.60	**ND**	1.40
Thallium	**ND**	1.00	**ND**	1.50	**BMDL**	2.50	**BMDL**	1.60	**ND**	1.40
Zinc	**2.10**	2.00	**54.00**	2.90	**330.00**	4.90	**140.00**	3.20	**120.00**	2.90
Cyanide	**0.55**	0.50	**ND**	0.74	**ND**	1.20	**ND**	0.79	**ND**	0.71

CONC. – Concentration of Compound
D.L. – Detection Limit
ND – Not Detected
BMDL – Present below detection limit
B – Blank sample

The tanks are constructed of concrete and are flat-bottomed with steel plate or concrete slab covers. Tank 4 and Tank 5 contained both liquid and solids. Tank 6 and Tank 7 contained only clear liquid. The samples (liquid and solids) were analyzed for VOCs, BNAs, pesticides/PCBs, and metals. The results, summarized in Table 5-3, indicate:

- Benzene and chlorobenzene were detected at elevated concentrations in the water in Tanks 4, 5, and 6. These compounds were also detected in the solids of Tanks 4 and 5.

- BNAs were detected in the water and solids of Tanks 4 and 5.

- PCBs were detected in the solids of Tanks 4 and 5. As noted in Subsection 5.1, the PCB results in the solids may be false positives due to interference of elevated concentrations of chlorinated solvent compounds. PCBs were not detected in the water of any tanks.

- Chromium and lead were consistently detected at low concentrations in the water of the tanks. Metals were detected in the solids of Tanks 4 and 5.

Tank 4 had the highest concentrations of organics in both the solids and water. Physically the tank contained a lot of paper and was clearly part of the sanitary system. The "solids" sample was basically a sample of the paper. It is not surprising to see the high concentrations, since the paper would have a high rate of absorption. However, there is no free mass of chemicals in the tank. The bottoms of the tanks are all below the shallow groundwater table and the water in the tanks may mix with groundwater (this will be better assessed when the tanks are cleaned).

The water sample from Septic Tank 4 contains levels of dichlorobenzene and trichlorobenzene that are elevated but much lower than nearby wells MW-2, 4, 5 (which

TABLE 5-3
SUMMARY OF SEPTIC TANK ANALYTICAL DATA
VOLATILES AND SEMIVOLATILES
SCCC, KEARNY, NJ

LAB NUMBER	CB2211		CB2210		CB2209		CB2212		CB2204		CB2203	
SAMPLE NUMBER	Tank 4		Tank 5		Tank 6		Tank 7		Tank 4		Tank 5	
MEDIA	WATER		WATER		WATER		WATER		SLUDGE		SLUDGE	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
VOC Compound ((ug/L)									(mg/kg)			
Benzene	1700	1000	450	50	470	50	ND	10	160	33	65 J	160
Chlorobenzene	14000	1000	1700	50	1600	100	5 J	10	2800	33	1700	160
Toluene	ND	1000	24 J	50	ND	50	ND	10	ND	33	8.4 J	160
Xylene	ND	1000	ND	50	17 J	50	ND	10	ND	33	ND	160
Tetrachloroethene	ND	1000	ND	50	ND	50	ND	10	26	33	ND	160
BNA Compound (ug/L)									(mg/kg)			
1,2-Dichlorobenzene	160	11	26	10	3 J	10	ND	10	100000	5600	1 J	27
1,3-Dichlorobenzene	1000	11	20	10	18	10	ND	10	67000	5600	38	27
1,4-Dichlorobenzene	540	11	24	10	24	10	ND	10	51000	5600	130	27
Naphthalene	15	11	2 J	10	ND	10	ND	10	1100	5600	330	27
2-Methyl Naphthalene	15	11	2 J	10	ND	10	ND	10	4500	5600	10	27
1,2,4-Trichlorobenzene	360	11	7 J	10	ND	10	ND	10	45000	5600	ND	27
Phenol	15	11	14	10	ND	10	ND	10	ND	5600	ND	27
2,4-Dimethyl phenol	ND	11	ND	10	ND	10	ND	10	ND	5600	ND	27
2,4-Dichlorophenol	86	11	3 J	10	ND	10	ND	10	ND	5600	ND	27
2,3,4-Trichlorophenol	16 J	11	ND	10	ND	10	ND	10	ND	5600	ND	27
2-Chlorophenol	85	11	22	10	ND	10	ND	10	ND	5600	ND	27
Fluoranthene	ND	11	ND	10	ND	10	ND	10	ND	5600	43	27
Pyrene	ND	11	ND	10	ND	10	ND	10	ND	5600	28	27
Benzo(a)anthracene	ND	11	ND	10	ND	10	ND	10	ND	5600	31	27
Chrysene	ND	11	ND	10	ND	10	ND	10	ND	5600	38	27
Benzo(b)fluoranthene	ND	11	ND	10	ND	10	ND	10	ND	5600	48	27
Benzo(a)pyrene	ND	11	ND	10	ND	10	ND	10	ND	5600	52	27
Indeno(1,2,3-cd)pyrene	ND	11	ND	10	ND	10	ND	10	ND	5600	52	27
Benzo(g,h,i)perylene	ND	11	ND	10	ND	10	ND	10	ND	5600	50	27
PEST/PCB (ug/L)[1]									(mg/kg)			
Arochlor 1254	ND	1.1	ND	1	ND	1	ND	1	21	5.5	44	5.5

CONC. – Concentration of compound
D.L. – Detection Limit
ND – Not detected
J – Compound found at concentration (estimated value) below the detection limit
[1]Laboratory method may detect false positives due to interference of elevated concentrations of chlorinated solvent compounds.

TABLE 5-3 (Continued)
SUMMARY OF SEPTIC TANK ANALYTICAL DATA
METALS
SCCC, KEARNY, NJ

LAB NUMBER	CB2211		CB2210		CB2209		CB2212		CB2204		CB2203	
SAMPLE NUMBER	Tank 4		Tank 5		Tank 6		Tank 7		Tank 4		Tank 5	
MEDIA	WATER		WATER		WATER		WATER		SLUDGE		SLUDGE	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
Metal (ug/L)									(mg/kg)			
Antimony	ND	60	ND	60	ND	60	BMDL	60	BMDL	24	ND	24
Arsenic	ND	10	ND	10	ND	10	BMDL	10	4.23	4	11.2	4
Beryllium	ND	1	ND	1	ND	1	ND	1	ND	0.4	ND	0.4
Cadmium	ND	2	ND	2	ND	2	ND	2	2.77	0.8	8.29	0.8
Chromium	13.5	10	19	10	67.7	10	35.7	10	458	4	1930	4
Copper	ND	10	ND	10	ND	10	BMDL	10	236	4	284	4
Lead	5.65	1	BMDL	1	24.9	1	7.58	1	168	30	161	30
Mercury	BMDL	0.2	BMDL	0.2	BMDL	0.2	ND	0.2	2.61	0.32	3.43	0.32
Nickel	ND	20	ND	20	ND	20	ND	20	16.3	8.1	87.2	8.1
Selenium	ND	5	ND	5	ND	5	ND	5	1.18	2	1.1	2
Silver	ND	10	ND	10	ND	10	ND	10	ND	4	BMDL	4
Thallium	ND	10	ND	10	ND	10	ND	10	ND	4	ND	4
Zinc	BMDL	20	BMDL	20	BMDL	20	154	20	1100	8.1	696	8.1
Cyanide	4	2	2	2	2.1	2	ND	2	4	0.6	3.1	0.6

CONC. – Concentration of compound
D.L. – Detection Limit
ND – Not detected
BMDL – Present below method detection limit, estimated concentration not reported by laboratory

is upgradient) and MW-15. Levels of these compounds in Tanks 5 through 7 were much lower or not detected. Naphthalene and phenols were found in Tanks 4 and 5 and the wells at low parts per billion ranges of concentrations. Benzene was found in Tanks 4, 5, and 6 at 0.45 to 1.7 ppm and at similar concentrations in downgradient wells. Chlorobenzene was found in all nearby wells and in Tanks 4, 5, and 6. Levels of chlorobenzene in Tank 4 were an order of magnitude higher than the other tanks or the well. This is the only case where tank concentrations were higher than nearby groundwater.

Tank 5 was described as containing oily residue which is reflected in some of the BNA PAH compounds found in Tank 5 solids but not in Tank 4. These compounds were not found in the water samples.

The septic tanks reflect contamination levels seen throughout this area and do not appear to be a "hot spot" source of contaminants. It is possible that the organic constituents in the tanks are from small releases to the building drains over the life of the tank's use or equally possible that the contaminants could have been introduced from the surrounding groundwater.

5.2.4 Chromium Waste

A total of eight test pits were completed and sampled below the visible base of the slag fill material which ranged from 1.5 to 6 ft (Figure 5-1). The thickness of the slag fill varies across the site. Table 5-4 includes the depth of the sample (collected below the slag fill) and the laboratory results for each test pit. The samples were analyzed for total chromium with concentration ranging from 1,740 to 34,900 mg/kg. All but one sample was above 26,000 mg/kg (2.6 percent). This indicates that the fill material below the slag has been impacted by the chromium waste. The chromium has either mixed or leached from the slag material to the fill below.

Table 5-4

Summary of Test Pit Analytical Data
Chromium
SCCC, Kearny, NJ

Test Pit Sample Location	Lab ID Number	Depth of Sample (ft)	Chromium (mg/kg)	Detection Limit
TP #1	HA3643	4.0	31900	1.9
TP #2	HA3632	1.5	1740	1.3
TP #3	HA3639	2.0	26300	1.6
TP #4	HA3636	2.0	34900	1.6
TP #5	HA3637	6.0	33100	1.6
TP #6	HA3641	2.5	30400	1.7
TP #7	HA3640	2.0	32100	1.5
TP #8	HA3679	3.0	32600	1.9

5.3 SECONDARY SOURCE AREAS

Secondary source areas at SCCC consist of surface and subsurface soils that contain elevated levels of contaminants that could continue to impact surface water and groundwater through sediment transport on the surface and leaching of chemicals to the groundwater. Two types of areas were addressed: the chromium waste which covers most of the property, and organic constituents in soils around the old process area and adjacent to Building 2.

5.3.1 Soils in Former Production and Product Handling Areas

During the two phases of the RI, a total of 17 soil samples were collected and analyzed, including:

- Ten surface soils in former aboveground tank areas around the distillation building.

- Seven soil boring samples at three boring locations adjacent to Building 2.

Ten soil samples from the former aboveground tank area (Figure 5-2) were collected and analyzed for VOCs and BNAs. The results in Table 5-5 indicate:

- Low levels of VOC's benzene, chlorobenzene, methylene chloride, trans-1,2-dichloroethene (trans-1,2-DCE), tetrachloroethene (PCE), and trichloroethene (TCE) were detected.

- Elevated levels (percentages) of BNA compounds were detected, including naphthalene, other PAHs, dichlorobenzenes, and 1,2,4-trichlorobenzene.

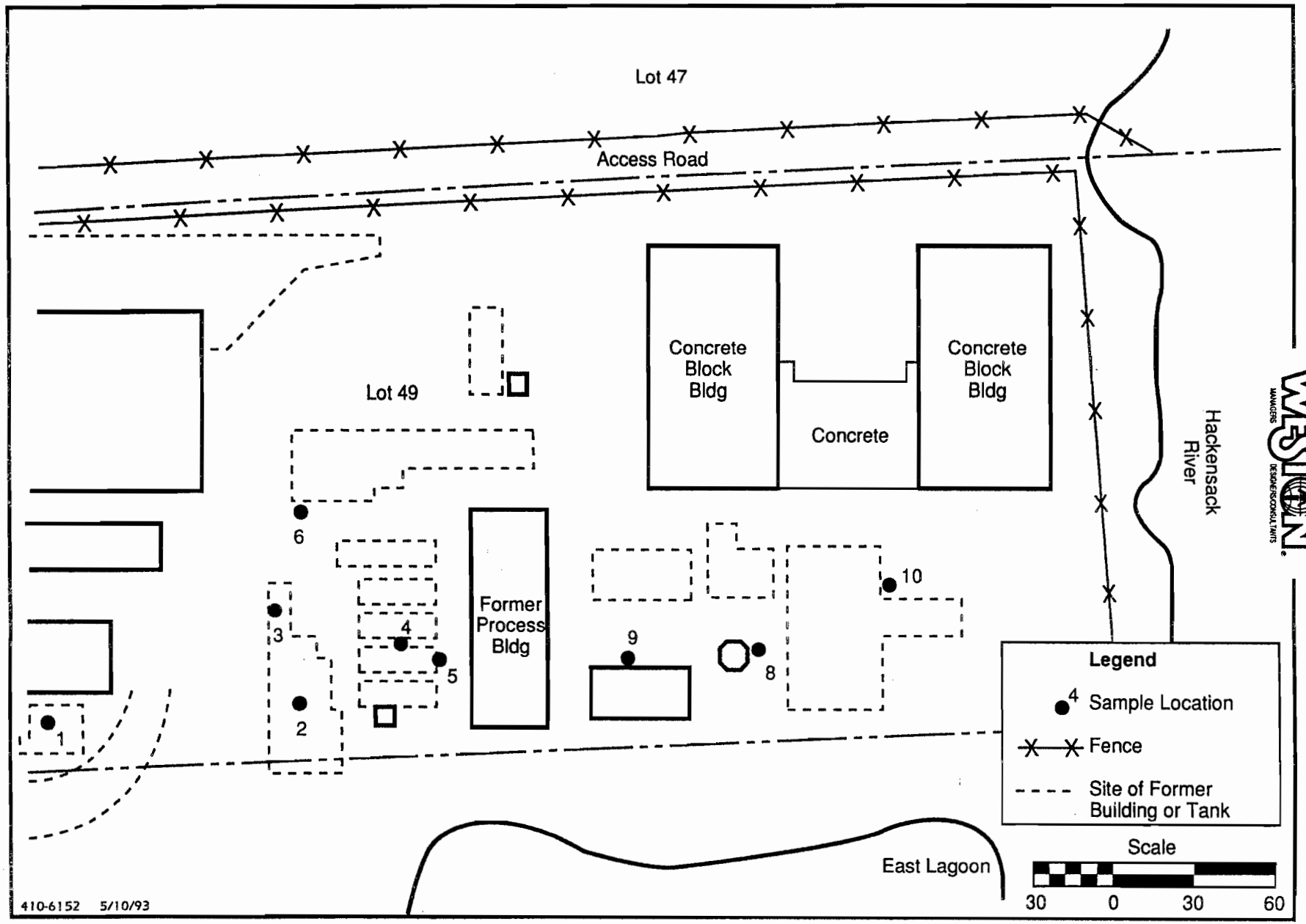


FIGURE 5-2 LOCATION OF TANK SOIL SAMPLES DECEMBER 1990

TABLE 5-5
SUMMARY OF SOIL ANALYTICAL DATA
VOLATILE AND SEMIVOLATILE ORGANICS
SCCC, KEARNY, NJ

LAB NUMBER	HA3566		HA3565		HA3564		HA3572		HA3570		HA3571		HA3573	
SAMPLE NUMBER	TSS-1		TSS-2		TSS-3		TSS-4		TSS-5		TSS-6		TSS-7	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
VOC Compound (ug/kg)														
Benzene	ND	27000	ND	6400	ND	7.20	ND	3300	BMDL	110.0	ND	76.0	ND	7.50
Chlorobenzene	99600	38000	ND	8700	BMDL	9.80	5940	4500	300.0	150.0	ND	100.0	BMDL	10.00
Methylene Chloride	ND	18000	5690	4100	ND	4.60	ND	2100	114.0	72.0	70.8	48.0	6.57	4.70
1,2 Trans-dichloroethylene	ND	10000	ND	2300	ND	2.60	ND	1200	76.5	41.0	ND	28.0	20.50	2.70
Tetrachloroethylene	ND	26000	ND	5900	BMDL	6.70	ND	3100	2310.0	110.0	BMDL	71.0	12.50	6.90
Trichloroethylene	ND	12000	ND	2800	ND	3.10	ND	1400	866.0	49.0	ND	33.0	29.20	3.20
BNA Compound (ug/kg)														
Acenaphthene	92000	12000	219000	2700	ND	3100	BMDL	2900	11800	4900	ND	3300	ND	3200
Acenaphthylene	24100	22000	BMDL	5100	ND	5700	ND	5300	ND	9000	ND	6000	ND	5900
Anthracene	46200	12000	7290	2700	ND	3100	ND	2900	ND	4900	ND	3300	ND	3200
Benzo(a)anthracene	BMDL	49000	BMDL	11000	BMDL	13000	BMDL	12000	BMDL	20000	BMDL	13000	ND	13000
Benzo(a)pyrene	ND	16000	3840	3600	34100	4100	6580	3800	ND	6400	4910	4300	4950	4200
Benzo(b)fluoranthene	ND	30000	BMDL	6900	65800	7900	16700	7200	14000	12000	11600	8200	8700	8100
Benzo(ghi)perylene	ND	26000	BMDL	5900	31400	6700	7940	6200	BMDL	11000	9050	7000	10500	6900
bis(2-Ethylhexyl)phthalate	ND	63000	ND	14000	ND	16000	ND	15000	30000	26000	34500	17000	44500	17000
Chrysene	41900	16000	7420	3600	14600	4100	12000	3800	12500	6400	6670	4300	4830	4200
Dibenzo(a,h)anthracene	ND	16000	ND	3600	7280	4100	ND	3800	ND	6400	ND	4300	ND	4200
1,2-Dichlorobenzene	3850000	12000	4680000	2700	12100	3100	34400	2900	522000	4900	10800	3300	3780	3200
1,3-Dichlorobenzene	1210000	12000	738000	2700	14500	3100	9590	2900	394000	4900	9500	3300	6400	3200
1,4-Dichlorobenzene	2230000	27000	4840000	6400	54600	7200	15000	6600	52200	11000	15700	7600	BMDL	7400
Di-n-butyl phthalate	ND	63000	ND	14000	ND	16000	ND	15000	ND	26000	ND	17000	ND	17000
Fluoranthene	121000	14000	12300	3200	7280	3600	8990	3300	12300	5600	5330	3800	BMDL	3700
Fluorene	213000	12000	45600	2700	ND	3100	ND	2900	BMDL	4900	ND	3300	ND	3200
Hexachlorobenzene	45000	12000	137000	2700	ND	3100	30400	2900	359000	4900	56900	3300	21100	3200
Hexachlorobutadiene	ND	5600	8520	1300	ND	1500	ND	1400	ND	2300	ND	1500	ND	1500
Indeno(1,2,3-c,d)pyrene	ND	23000	BMDL	5400	35900	6100	10500	5600	BMDL	9500	10100	6400	11300	6300
Naphthalene	2370000000	10000	167000	2300	191000	2600	5020	2400	ND	4100	51800	2700	7310	2700
Phenanthrene	428000	34000	35300	7800	BMDL	8900	10900	8100	19300	14000	BMDL	9300	ND	9100
Pyrene	70500	12000	8020	2700	6690	3100	5800	2900	7690	4900	4310	3300	BMDL	3200
1,2,4-Trichlorobenzene	75000000	12000	3040000	2700	6360	3100	14100000	2900	68200000	4900	30100	3300	25400	3200

CONC. – Concentration of Compound
D.L. – Detection Limit
ND – Not Detected
BMDL – Present below detection limit
B – Blank sample

TABLE 5-5 (Continued)
SUMMARY OF SOIL ANALYTICAL DATA
VOLATILE AND SEMIVOLATILE ORGANICS
SCCC, KEARNY, NJ

LAB NUMBER SAMPLE NUMBER	HA3574 TSS-8		HA3569 TSS-9		HA3568 TSS-9D		HA3567 TSS-10	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
VOC Compound (ug/kg)								
Benzene	ND	6.70	ND	8100	ND	6600	BMDL	6.90
Chlorobenzene	ND	9.10	33500	11000	68400	9000	89.10	9.40
Methylene Chloride	ND	4.20	7020	5200	5980	4200	ND	4.40
1,2 Trans-dichloroethylene	ND	2.40	ND	3000	ND	2400	ND	2.50
Tetrachloroethylene	ND	6.20	ND	7600	BMDL	6100	9.91	6.40
Trichloroethylene	ND	2.90	ND	3500	ND	2800	ND	3.00
BNA Compound (ug/kg)								
Acenaphthene	ND	2900	ND	3500	BMDL	2800	3810	3000
Acenaphthylene	ND	5300	ND	6500	ND	5200	ND	5500
Anthracene	ND	2900	3830	3500	4270	2800	8050	3000
Benzo(a)anthracene	ND	12000	BMDL	14000	BMDL	12000	BMDL	12000
Benzo(a)pyrene	BMDL	3800	BMDL	4600	ND	3700	ND	3900
Benzo(b)fluoranthene	BMDL	7200	33100	8900	ND	7100	ND	7500
Benzo(ghi)perylene	BMDL	6200	9000	7600	6810	6100	ND	6400
bis(2-Ethylhexyl)phthalate	ND	15000	ND	19000	ND	15000	ND	16000
Chrysene	ND	3800	21500	4600	17200	3700	10900	3900
Dibenzo(a,h)anthracene	ND	3800	ND	4600	ND	3700	ND	3900
1,2-Dichlorobenzene	ND	2900	4340000	3500	6470000	2800	6530	3000
1,3-Dichlorobenzene	ND	2900	1270000	3500	1550000	2800	66200	3000
1,4-Dichlorobenzene	ND	6600	876000	8100	1200000	6500	41700	6900
Di-n-butyl phthalate	ND	15000	ND	19000	ND	15000	ND	16000
Fluoranthene	BMDL	3300	33800	4100	23400	3300	18900	3400
Fluorene	ND	2900	ND	3500	BMDL	2800	24400	3000
Hexachlorobenzene	BMDL	2900	34800	3500	23800	2800	ND	3000
Hexachlorobutadiene	ND	1400	ND	1700	ND	1300	ND	1400
Indeno(1,2,3-c,d)pyrene	BMDL	5600	11100	6900	7660	5500	ND	5800
Naphthalene	16700	2400	ND	3000	ND	2400	448000	2500
Phenanthrene	BMDL	8100	59700	10000	59900	8000	179000	8400
Pyrene	BMDL	2900	17100	3500	11900	2800	21500	3000
1,2,4-Trichlorobenzene	28300	2900	100000000	3500	200000000	2800	62800	3000

CONC. – Concentration of Compound
D.L. – Detection Limit
ND – Not Detected
BMDL – Present below detection limit
B – Blank sample

Chlorobenzene, ranging in concentration from below the method detection limit to 99.6 mg/kg, was the most common VOC contaminant found in the tank area soils. The most common BNAs found were dichlorobenzene (as high as 10 percent), naphthalene, and 1,2,4-trichlorobenzene (up to 75 percent).

A total of seven subsurface soil samples were collected from four soil borings near Building 2. The samples were analyzed for VOCs, BNAs, pesticides/PCBs, and metals. One of the samples was collected from the boring for monitor well MW-2L adjacent to the active septic tank on the north side of Building 2. The other six samples (two per boring) were collected from three soil borings completed during the supplementary investigation near Building 2. One sample was taken just above groundwater and one above in the sand above the clay. The sample locations are shown on Figure 5-1. The results (Table 5-6) indicate:

- Elevated levels of chlorobenzene, benzene, along with lower concentrations of chlorinated VOCs (PCE, 1,1,1-TCA) were found in the soil samples.

- Low concentrations of PCBs (Aroclor 1248 and 1260) were detected (below the NJDEPE cleanup standard of 2 mg/kg).

- Dichlorobenzenes and 1,2,4-trichlorobenzene were detected at elevated concentrations in all samples but were highest in SB-2B which is near MW-15L between Buildings 2 and 4. PAHs were limited to the shallow sample at SB-2.

- Several metals were detected with arsenic, lead, and chromium at elevated concentrations.

TABLE 5-6
SUMMARY OF ANALYTICAL DATA
SOIL BORINGS
VOLATILE AND SEMIVOLATILE ORGANICS
SCCC, KEARNY, NJ

LAB NUMBER SAMPLE NUMBER	HA3563 MW-2L		CB2169 SB-2A		CB2170 SB-2B		CB2177 SB-3A		CB2179 SB-3B		CB2176 SB-4A		CB2178 SB-4B	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
VOC's (ug/kg)														
Chloromethane	ND	1100	ND	13	ND	71000	ND	1400	350 J	1500	180	1500	ND	2000
Acetone	NA	NA	16	13	4300 J	71000	ND	1400	ND	1500	350 J	1500	410	2000
2-Butanone	NA	NA	ND	13	ND	71000	450 J	1400	170 J	1500	560 J	1500	ND	2000
1,1,1-Trichloroethane	ND	400	ND	13	ND	71000	360 J	1400	ND	1500	500 J	1500	460	2000
Carbon Tetrachloride	ND	300	ND	13	ND	71000	ND	1400	ND	1500	89 J	1500	ND	2000
Benzene	ND	470	ND	13	48000 J	71000	320 J	1400	110 J	1500	150 J	1500	600	2000
1,2-Dichloroethene	NA	NA	ND	13	ND	71000	ND	1400	790 J	1500	ND	1500	ND	2000
Chlorobenzene	BMDL	640	ND	13	220000	71000	15000	1400	91 J	1500	5100	1500	27000	2000
Toluene	NA	640	1 JB	13	960 J	71000	160 J	1400	ND	1500	210 J	1500	160	2000
Xylene	NA	NA	ND	13	ND	71000	ND	1400	ND	1500	150 J	1500	ND	2000
Tetrachloroethene	ND	440	3 J	13	ND	71000	ND	1400	16000	1500	150 J	1500	ND	2000
Styrene	NA	NA	ND	13	ND	71000	ND	1400	ND	1500	120 J	1500	ND	2000
BNA's (ug/kg)														
1,2-Dichlorobenzene	1140	460	6800 J	13000	9200000	1200000	400000	12000	ND	260000	98000 J	12000	ND	12000
1,3-Dichlorobenzene	833	460	3500 J	13000	1300000	1200000	410000	12000	ND	260000	12000 J	12000	ND	12000
1,4-Dichlorobenzene	1290	1100	3400 J	13000	1300000	1200000	430000	12000	ND	260000	7000 J	12000	ND	12000
Naphthalene	3220	390	5300 J	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
2 Methyl Naphthalene	NA	NA	6600 J	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
1,2,4-Trichlorobenzene	ND	460	6000 J	13000	240000 J	1200000	34000	12000	ND	260000	ND	12000	ND	12000
Acenaphthene	1100	460	25000	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
2,4, Dimethyl Phenol	ND	660	ND	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Dibenzofuran	NA	NA	15000	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Fluorene	1360	460	33000	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Phenanthrene	3660	1300	200000	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Anthracene	587	460	90000	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Carbazole	NA	NA	10000 J	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Fluoranthene	3140	530	200000	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Pyrene	1890	460	190000	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Benzo(a) anthracene	BMDL	1900	87000	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Chrysene	629	610	79000	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Benzo(b) Flouranthene	1800	1200	58000	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Benzo(a)Pyrene	BMDL	610	82000	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Indeno(1,2,3-cd) Pyrene	ND	900	54000	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Benzo(g,h,i) Perylene	ND	1000	53000	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
bis(2-Ethylhexyl)phthalate	9920	2400	ND	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Di-n-butyl phthalate	3060	2400	ND	13000	ND	1200000	ND	12000	ND	260000	ND	12000	ND	12000
Pest/PCB (ug/kg) [1]:														
Arochlor 1248	NA	NA	ND	1300	ND	39	ND	38	ND	42	ND	41	66	41
Arochlor 1254	NA	NA	ND	1300	ND	39	ND	38	ND	42	ND	41	ND	41
Arochlor 1260	NA	NA	ND	1300	ND	39	ND	38	300 J	42	61	41	ND	41

CONC. – Concentration of compound
D.L. – Detection Limit
ND – Not detected
BMDL – Present below method detection limit, estimated concentration not reported by laboratory
[1] Laboratory method may detect false positives due to interference of elevated concentrations of chlorinated solvent compounds.

TABLE 5-6 (Continued)
SUMMARY OF SOIL ANALYTICAL DATA
METALS
SCCC, KEARNY, NJ

LAB NUMBER	HA3563		CB2169		CB-2170		CB2177		CB2179		CB2176		CB2178	
SAMPLE NUMBER	MW-2L		SB-2A		SB-2B		SB-3A		SB-3B		SB-4A		SB-4B	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
Metal (mg/L)														
Antimony	**BMDL**	13	**ND**	24	**ND**	24	**ND**	24	**ND**	24	**47.5**	24	**20.1**	24
Arsenic	**BMDL**	2.1	**4.21**	4	**BMDL**	4	**2.53**	4	**2.71**	4	**41.9**	4	**13.2**	4
Beryllium	**BMDL**	0.21	**BMDL**	0.4	**BMDL**	0.4	**BMDL**	0.4	**BMDL**	0.4	**BMDL**	0.4	**BMDL**	0.4
Cadmium	**0.93**	0.43	**BMDL**	0.8	**ND**	0.8	**BMDL**	0.8	**BMDL**	0.8	**4.16**	0.8	**1.9**	0.8
Chromium	**593**	2.1	**36.7**	4	**4.45**	4	**685**	4	**0.39**	4	**428**	4	**130**	4
Copper	**26**	2.1	**23.6**	4	**BMDL**	4	**109**	4	**23.2**	4	**335**	4	**124**	4
Lead	**640**	16	**270**	30	**4.82**	30	**53**	30	**19.9**	30	**647**	30	**241**	30
Mercury	**BMDL**	0.17	**0.55**	0.32	**ND**	0.32	**BMDL**	0.32	**BMDL**	0.32	**ND**	0.32	**BMDL**	0.32
Nickel	**45**	4.3	**9.4**	8.1	**BMDL**	8.1	**14.6**	8.1	**9.73**	8.1	**51.8**	8.1	**25.5**	8.1
Selenium	**NA**	NA	**BMDL**	2	**ND**	2	**ND**	2	**ND**	2	**BMDL**	2	**ND**	2
Silver	**BMDL**	2.1	**ND**	4	**ND**	4	**ND**	4	**ND**	4	**BMDL**	4	**ND**	4
Thallium	**NA**	NA	**ND**	4	**ND**	4	**ND**	4	**ND**	4	**ND**	4	**ND**	4
Zinc	**55**	4.3	**99.3**	8.1	**14.2**	8.1	**90.6**	8.1	**42.3**	8.1	**3710**	8.1	**1520**	8.1
Cyanide	**1.2**	1.1	**ND**	0.6	**ND**	0.6	**2.1**	0.6	**ND**	0.6	**ND**	0.6	**ND**	0.6

CONC. – Concentration of compound
D.L. – Detection Limit
ND – Not detected
NA – Not analyzed
BMDL – Present below method detection limit, estimated concentration not reported by laboratory

Free phase product was observed in sample SB-2 (B) from the sand just above the clay, and in the groundwater sample from MW-15L. Based on these results, it appears that the soils (and free phase product) in the vicinity of Building 2 are a continuing source of contamination to the groundwater. The source of the contamination appears to be from the handling of materials shipped to and from the site.

5.3.2 Transformer Area Sediment

One sediment sample (S-3) was collected from the surface of a concrete pad in a former transformer area (Figure 5-1) and analyzed for PCBs. Elevated PCB Aroclor-1260 (5,160 mg/kg) were detected in the sediment. This sample was analyzed only for PCBs, therefore it is not known whether interference effects produced by the presence of high concentrations of chlorobenzenes affect the reliability of the PCBs results (see Subsection 5.1).

5.4 MIGRATION PATHWAYS

The RI addressed two potential migration pathways for chemical releases from the site: surface water drainage and groundwater.

5.4.1 Surface Drainage

5.4.1.1 Description of Site Drainage

Surface water drains from the site along two paths which lead respectively to outfalls to the Hackensack River at the northeastern and southeastern corners of the property. The northeast outfall receives drainage from the northwestern corner of the property. Runoff collects in a depression which drains through a culvert into a buried storm drain which runs along the entire northern border of the SCCC property. The storm drain also receives runoff from the Belleville Turnpike. The outfall is totally submerged at high

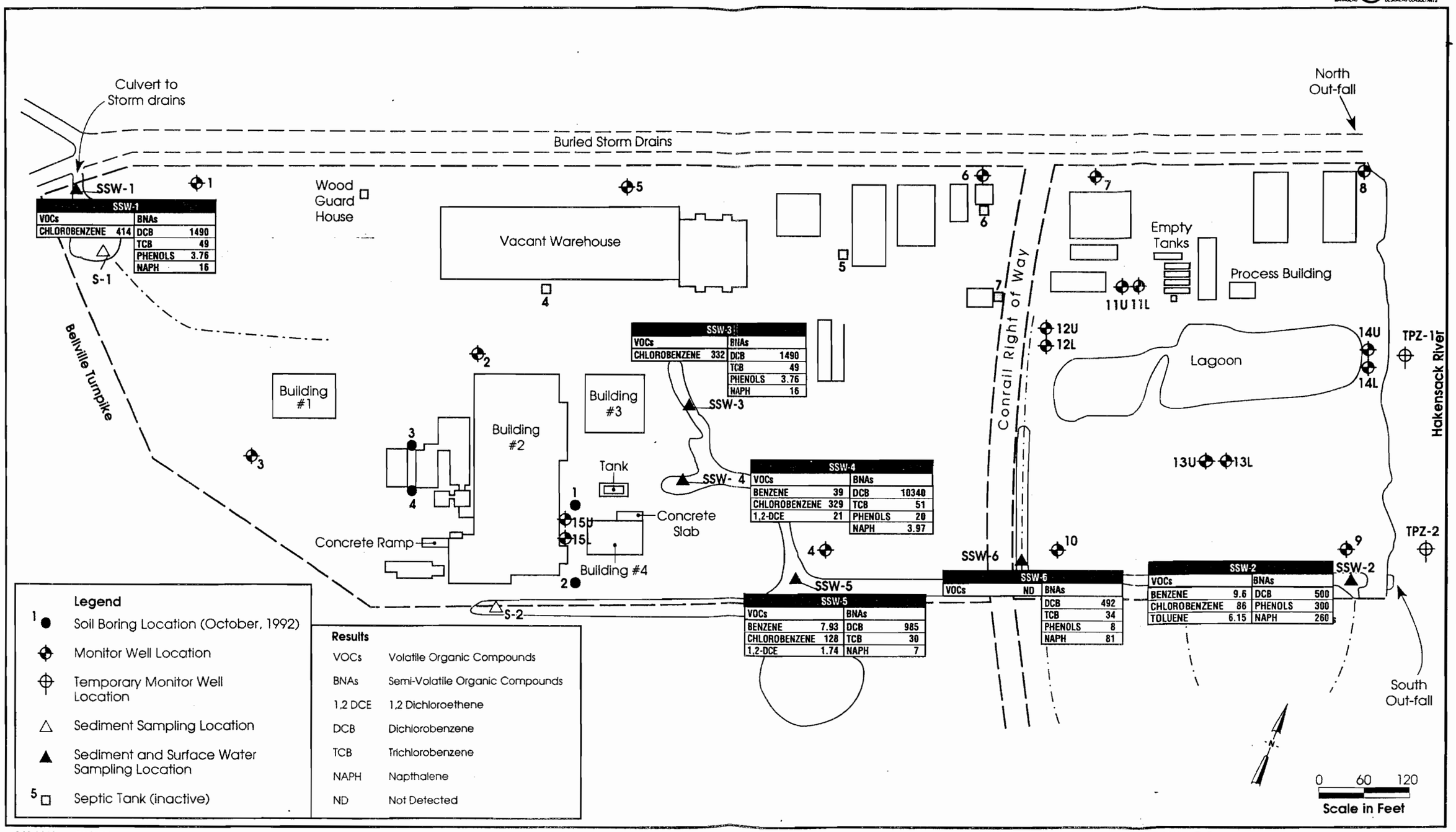
tide. As part of the chromium IRMs, the depression and adjacent land surface were covered with geofabric and gravel.

Most of the site drainage reaches the drainage ditch running along the southern edge of the property adjacent to the railroad right-of-way and branching into the center of the property where the facility's NJPDES outfall is located. This ditch also receives runoff from the adjacent property to the south owned by Koppers. Based on the groundwater flow gradient and elevation of the ditch, shallow groundwater also discharges to the ditch. All flow from the ditch discharges to the Hackensack River through a concrete pipe approximately 24 inches in diameter. A tide valve on the river side of the pipe effectively stops backflow during high tide conditions and, except during storm periods, flow is sluggish. Figure 5-1 illustrates the main site drainage features.

The sediments in all of the drainage ditches and depressions have a yellow-brown color which also forms a scum on the water surface. This appears to be related to the chromium waste fill. Organic constituents from the site would also reach the drainage areas via surface transport of dissolved chemicals in surface water or transport of contaminated soils. Contaminants in groundwater discharging to the ditch could also be a source of contaminants in surface water. There is no evidence that lagoon waste materials discharged to surface drainage in the past. All of the site west of the railroad right-of-way has been capped, excluding the sections of the drainage ditch. There is, therefore, no contact between the surface soils and runoff from that area.

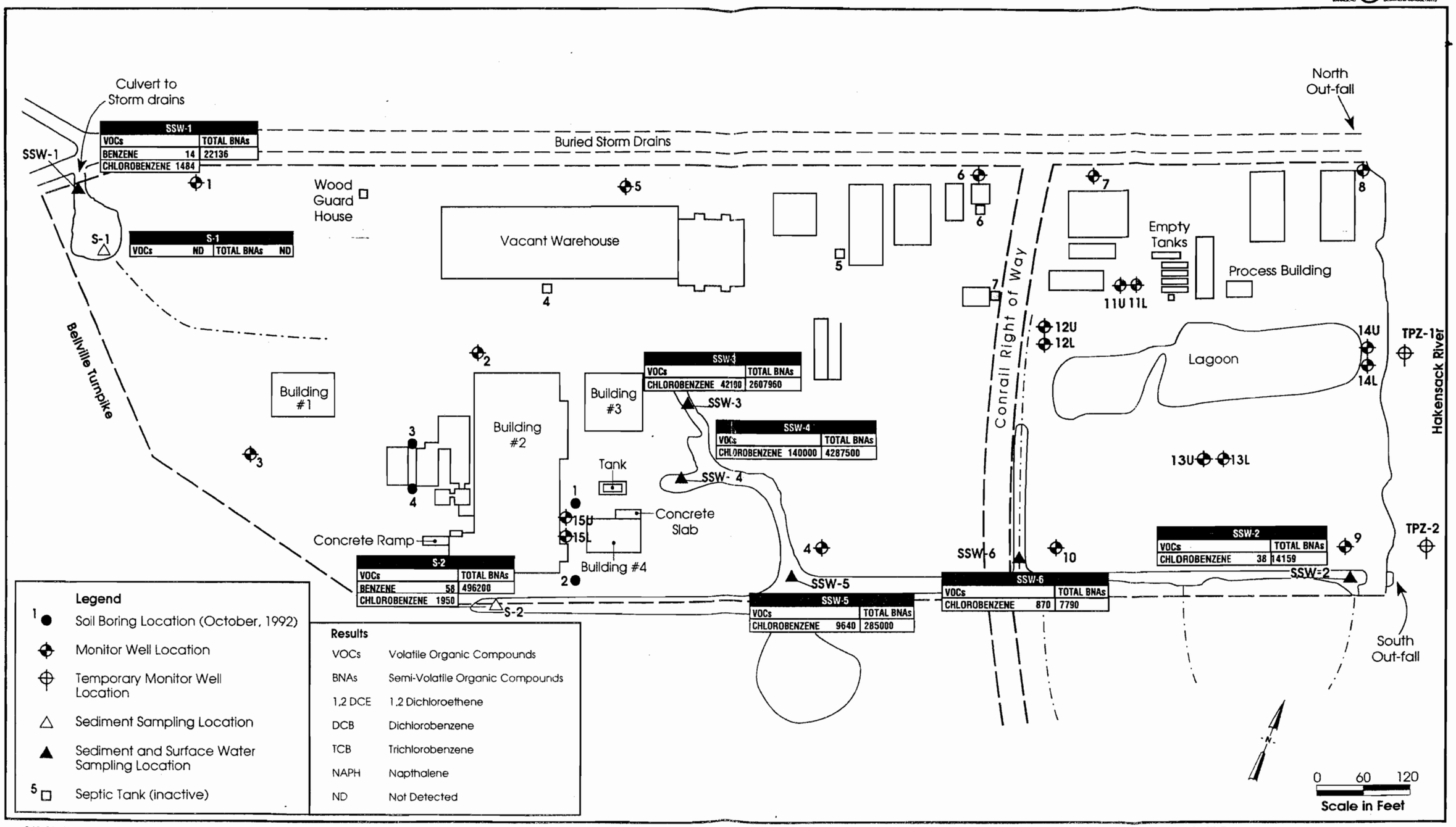
5.4.1.2 Surface Water and Sediment Analytical Results

Six representative locations in the system were sampled for surface water and sediments (SSW-1 through 6) and two locations for sediments only (S-1 and S-2). The sampling locations and analytical results are presented in Figures 5-3 and 5-4. The samples were analyzed for VOCs, BNAs, metals, cyanide, and phenolics. The surface water results (Table 5-7) indicate:



846-9813c 5/17/93

FIGURE 5-3
VOLATILE AND SELECTED SEMI-VOLATILE CONCENTRATIONS IN SURFACE WATER, (ppb)
STANDARD CHLORINE,
KEARNY, NJ



846-9813f 5/10/93

FIGURE 5-4
VOLATILE AND TOTAL SEMI-VOLATILE CONCENTRATIONS IN SEDIMENTS, (ppb)
STANDARD CHLORINE,
KEARNY, NJ

TABLE 5-7
SUMMARY OF SURFACE WATER ANALYTICAL DATA
VOLATILES AND SEMIVOLATILES
SCCC, KEARNY, NJ

LAB NUMBER	HA-3586		HA-3588		HA-3584		HA-3587		HA-3585		HA-3558		CB2717		HA-3575		HA-3602	
SAMPLE NUMBER	SSW-1		SSW-2		SSW-3		SSW-4		SSW-5		SSW-5-Dup		SSW-6		Field Blank		Trip Blank	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
VOC Compound (ug/L)																		
Benzene	ND	22.0	9.7	4.4	ND	22.0	39.8	22.0	7.9	4.4	6.1	4.4	ND	10	ND	4.4	ND	4.4
Chlorobenzene	414.0	30.0	86.0	6.0	332.0	30.0	329.0	30.0	128.0	6.0	107.0	6.0	ND	10	ND	6.0	ND	6.0
Ethylbenzene	ND	36.0	BMDL	7.2	ND	36.0	ND	36.0	BMDL	7.2	ND	7.2	ND	10	ND	7.2	ND	7.2
Methylene chloride	ND	14.0	BMDL	2.8	ND	14.0	ND	14.0	ND	2.8	ND	2.8	3 J	10	ND	2.8	ND	10.0
1,2-Trans-dichloroethene	ND	8.0	ND	1.6	ND	8.0	21.0	8.0	1.7	1.6	1.7	1.6	ND	10	ND	1.6	ND	1.6
Toluene	ND	30.0	6.2	6.0	BMDL	30.0	ND	30.0	BMDL	6.0	ND	6.0	ND	10	BMDL	6.0	BMDL	6.0
Trichloroethene	ND	9.5	ND	1.9	ND	9.5	ND	9.5	ND	1.9	ND	1.9	ND	10	2.0	1.9	ND	1.9
Xylenes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	10	NA	NA	NA	NA
BNA Compound (ug/L)																		
Acenaphthene	ND	2.0	12.3	2.0	ND	2.1	ND	2.0	ND	2.2	ND	2.1	93	57	ND	2.0	NA	NA
Acenaphtylene	ND	3.6	BMDL	3.7	ND	3.8	ND	3.7	ND	4.0	ND	3.8	ND	57	ND	3.7	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	52 J	57	NA	NA	NA	NA
1,2-Dichlorobenzene	171.0	2.0	224.0	2.0	542.0	2.1	2740.0	2.0	321.0	2.2	320.0	2.1	170	57	ND	2.0	NA	NA
1,3-Dichlorobenzene	296.0	2.0	85.5	2.0	432.0	2.1	2920.0	2.0	278.0	2.2	288.0	2.1	82	57	ND	2.0	NA	NA
1,4-Dichlorobenzene	369.0	4.6	192.0	4.6	517.0	4.8	4680.0	4.7	385.0	5.0	394.0	4.8	240	57	ND	4.7	NA	NA
Fluorene	ND	2.0	2.8	2.0	ND	2.1	ND	2.0	ND	2.2	ND	2.1	26 J	57	ND	2.0	NA	NA
Isophorone	ND	2.3	ND	2.3	ND	2.4	ND	2.3	5.2	2.5	5.5	2.4	ND	57	ND	2.3	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	41 J	57	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	340	57	NA	NA	NA	NA
Naphthalene	9.1	1.7	260.0	1.7	16.4	1.8	4.0	1.7	7.1	1.8	6.8	1.7	81	57	ND	1.7	NA	NA
Phenanthrene	ND	5.6	BMDL	5.7	ND	5.9	ND	5.7	ND	6.1	ND	5.9	9 J	57	ND	5.7	NA	NA
1,2,4-Trichlorobenzene	ND	2.0	78.5	2.0	49.3	2.1	51.0	2.0	30.2	2.2	30.4	2.1	34 J	57	ND	2.0	NA	NA
2-Chlorophenol	3.9	3.4	ND	3.5	3.8	3.6	ND	3.5	BMDL	3.8	BMDL	3.6	ND	57	ND	3.5	NA	NA
2,4-Dichlorophenol	BMDL	2.8	ND	2.8	ND	3.0	19.8	2.9	ND	3.1	7.1	2.9	ND	57	ND	2.9	NA	NA
2,4-Dimethylphenol	17.6	2.8	60.4	2.8	ND	3.0	ND	2.9	ND	3.1	ND	2.9	1000	230	ND	2.9	NA	NA
Phenol	29.0	1.6	241.0	1.6	ND	1.6	ND	1.6	ND	1.7	ND	1.6	8 J	57	ND	1.6	NA	NA
Phenolics	0.07	0.05	0.43	0.05	ND	0.05	0.05	0.05	ND	0.05	ND	0.05	NA	NA	NA	NA	NA	NA

CONC. – Concentration of compound
D.L. – Detection Limit
ND – Not detected
NA – Not analyzed
J – Estimated concentration of compound detected below the detection limit
BMDL – Present below method detection limit, estimated concentration not reported by laboratory

TABLE 5-7 (Continued)
SUMMARY OF SURFACE WATER ANALYTICAL DATA
METALS
SCCC, KEARNY, NJ

LAB NUMBER	HA-3586		HA-3588		HA-3584		HA-3587		HA-3585		HA-3558		CB2717	
SAMPLE NUMBER	SSW-1		SSW-2		SSW-3		SSW-4		SSW-5		SSW-5-Dup		SSW-6	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
Metals (mg/L)														
Antimony	**BMDL**	0.060	**ND**	0.060	**ND**	0.060	**BMDL**	0.060	**ND**	0.060	**ND**	0.060	**ND**	24
Arsenic	**ND**	0.010	**ND**	0.010	**ND**	0.010	**0.010**	0.010	**ND**	0.010	**ND**	0.010	**BMDL**	5
Beryllium	**ND**	0.001	**ND**	0.001	**ND**	0.001	**0.002**	0.001	**ND**	0.001	**ND**	0.001	**ND**	0.2
Cadmium	**BMDL**	0.002	**BMDL**	0.002	**0.002**	0.002	**0.017**	0.002	**0.003**	0.002	**0.003**	0.002	**ND**	3
Chromium	**6.290**	0.010	**0.320**	0.010	**0.480**	0.010	**8.640**	0.010	**0.160**	0.010	**0.540**	0.010	**1240**	10
Copper	**0.023**	0.010	**BMDL**	0.010	**BMDL**	0.010	**0.200**	0.010	**BMDL**	0.010	**0.020**	0.010	**173**	10
Lead	**ND**	0.075	**ND**	0.075	**ND**	0.075	**1.000**	0.075	**BMDL**	0.075	**0.260**	0.075	**136**	1
Mercury	**BMDL**	0.000	**BMDL**	0.000	**ND**	0.000	**ND**	0.000	**ND**	0.000	**0.000**	0.000	**19.4**	0.2
Nickel	**ND**	0.020	**BMDL**	0.020	**BMDL**	0.020	**0.350**	0.020	**0.037**	0.020	**0.046**	0.020	**982**	20
Selenium	**ND**	0.005	**ND**	0.005	**ND**	0.005	**0.005**	0.005	**BMDL**	0.005	**BMDL**	0.005	**ND**	2
Silver	**0.013**	0.010	**BMDL**	0.010	**BMDL**	0.010	**BMDL**	0.010	**BMDL**	0.010	**BMDL**	0.010	**ND**	2
Thallium	**ND**	0.010	**ND**	0.010	**ND**	0.010	**ND**	0.010	**ND**	0.010	**ND**	0.010	**ND**	2
Zinc	**0.360**	0.020	**0.230**	0.020	**0.058**	0.020	**1.600**	0.020	**0.580**	0.020	**0.350**	0.020	**487**	20
Cyanide	**ND**	0.025	**ND**	0.025	**ND**	0.025	**ND**	0.025	**ND**	0.025	**ND**	0.025	**ND**	1

CONC. – Concentration of compound
D.L. – Detection Limit
ND – Not detected
BMDL – Present below method detection limit, estimated concentration not reported by laboratory

- Chlorobenzene was detected at all surface water locations. Benzene and 1,2-trans-dichloroethylene were found in some samples.

- Semivolatile compounds were also detected consistently across the site, including dichlorobenzenes, trichlorobenzenes, phenols, and naphthalene.

- Chromium, along with other metals, was detected consistently in the surface waters of the site. Cyanide was not detected in any surface waters.

The highest levels of chlorobenzene, dichlorobenzenes, and trichlorobenzenes were detected in samples from the western and central parts of the site. Benzene and 1,2-DCE were found in the central and eastern parts of the site. Naphthalene and phenols were detected at lower concentrations in the western and central portions of the site, with the highest level found in SSW-2 at the eastern end of the site.

The sediment results (Table 5-8) indicate:

- Chlorobenzene was found in all sediment samples. Benzene was detected in SSW-1 and S-2.

- Dichlorobenzenes, along with other BNAs, were detected in all sediment samples.

- Lead and chromium were detected at elevated concentrations in all the sediment samples.

- Cyanide was detected in SSW-2, SSW-3, and SSW-5. Phenolics were only detected in SSW-4.

TABLE 5-8
SUMMARY OF SEDIMENT ANALYTICAL DATA
VOLATILES AND SEMIVOLATILES
SCCC, KEARNY, NJ

LAB NUMBER	HA3579		HA3581		HA3580		HA3577		HA3578		HA3576		HA3582		CB-2174	
SAMPLE NUMBER	S-1		SSW-1		S-2		SSW-2		SSW-3		SSW-4		SSW-5		SSW-6	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
VOC Compound (ug/kg)																
Benzene	ND	16	14.9	13	58.4	58	BMDL	16	ND	8100	ND	18000	ND	1500	5 J	65
Chlorobenzene	ND	21	1484	18	1950	79	38.5	21	42100	11000	140000	24000	9640	2000	870	65
Methylene chloride	ND	10	13.6	8.2	61.1	37	ND	10	BMDL	5200	15000	11000	1360	930	23 JB	65
Toluene	ND	21	ND	18	BMDL	79	ND	21	ND	11000	ND	24000	ND	2000	11 J	65
Ethylbenzene	ND	26	ND	21	ND	95	ND	26	ND	13000	ND	29000	ND	2400	45 J	65
Xylenes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	49 J	65
BNA Compound (ug/kg)																
Acenaphthene	ND	680	ND	5600	ND	2500	BMDL	680	7860	7000	BMDL	7600	BMDL	13000	2300	430
Anthracene	ND	680	ND	5600	ND	2500	ND	680	BMDL	7000	ND	7600	ND	13000	500	430
Benzo(a)anthracene	ND	2800	ND	23000	ND	10000	BMDL	2800	BMDL	29000	BMDL	31000	ND	52000	1100	430
Benzo(a)pyrene	ND	890	ND	7300	ND	3300	ND	890	37700	9200	27900	10000	ND	17000	1200	430
Benzo(b)fluoranthene	ND	1700	ND	14000	ND	6300	ND	1700	37700	18000	44600	19000	ND	32000	2400	430
Benzo(g,h,i)perylene	ND	1500	ND	12000	ND	5300	ND	1500	36200	15000	23900	16000	ND	27000	1200	430
Bis(2-ethylhexyl)phthalate	17800	3600	BMDL	29000	ND	13000	ND	3600	ND	37000	65500	40000	188000	67000	ND	430
Carabzole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	220 J	430
Chrysene	ND	890	ND	7300	ND	3300	1100	890	28000	9200	33600	10000	ND	17000	1200	430
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1000	430
Di-n-Butylphthalate	ND	8600	ND	29000	ND	13000	ND	3600	ND	37000	ND	40000	ND	67000	170 J	430
1,2-Dichlorobenzene	BMDL	680	ND	5600	125000	2500	ND	680	723000	7000	1070000	7600	13300	13000	1100	430
1,3-Dichlorobenzene	1470	680	ND	5600	109000	2500	ND	680	593000	7000	1010000	7600	35200	13000	800	430
1,4-Dichlorobenzene	2090	1600	ND	13000	202000	5700	ND	1600	637000	16000	1170000	18000	48500	29000	1900	430
Fluoranthene	BMDL	780	ND	6400	BMDL	2900	3950	780	31500	8100	487000	8800	BMDL	15000	2100	430
Fluorene	ND	680	ND	5600	ND	2500	ND	680	BMDL	7000	ND	7600	ND	13000	1000	430
Indeno(1,2,3-cd)pyrene	ND	1300	ND	11000	ND	4800	ND	1300	48300	14000	27800	15000	ND	25000	1500	430
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	430
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1600	430
Naphthalene	ND	570	ND	4700	ND	2100	879	570	234000	5900	8800	6400	ND	11000	3400	430
Phenanthrene	BMDL	1900	ND	16000	BMDL	7000	4880	1900	23500	20000	47400	22000	ND	36000	1800	430
Pyrene	BMDL	680	ND	5600	BMDL	2500	3350	680	28500	7000	41800	7600	ND	13000	1700	430
1,2,4-Trichlorobenzene	776	680	ND	5600	60200	2500	ND	680	190000	7000	257000	7600	ND	13000	590	430
2,4-Dimethylphenol	ND	960	ND	7900	ND	3500	ND	960	ND	10000	ND	11000	ND	18000	ND	430
Phenol	ND	530	ND	4400	ND	2000	ND	530	ND	5000	ND	6000	ND	10000	ND	430
Phenolics	ND	0.57	ND	0.47	ND	0.21	ND	0.57	ND	0.59	0.69	0.64	ND	1.10	NA	NA

CONC. – Concentration of compound
D.L. – Detection Limit
NA – Not analyzed
ND – Not detected
J – Estimated concentration of compound detected below the detection limit
B – Compound also found in laboratory blank
BMDL – Present below method detection limit, estimated concentration not reported by laboratory.

TABLE 5-8 (Continued)
SUMMARY OF SEDIMENT ANALYTICAL DATA
METALS
SCCC, KEARNY, NJ

LAB NUMBER	HA3579		HA3581		HA3580		HA3577		HA3578		HA3576		HA3582		CB-2174	
SAMPLE NUMBER	S-1		SSW-1		S-2		SSW-2		SSW-3		SSW-4		SSW-5		SSW-6	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
Metals (ug/kg)																
Antimony	**26.00**	21.00	**100.00**	17.00	**BMDL**	7.90	**40.00**	21.00	**130.0**	22.00	**91.00**	24.00	**120.0**	41.00	**20.7**	24
Arsenic	**5.20**	3.60	**11.00**	2.90	**8.40**	1.30	**BMDL**	3.60	**14.0**	3.70	**20.00**	4.00	**21.0**	6.90	**29.6**	4
Beryllium	**BMDL**	0.36	**0.78**	0.29	**0.25**	0.13	**0.51**	0.36	**1.4**	0.37	**ND**	0.40	**1.5**	0.69	**ND**	0.4
Cadmium	**2.10**	0.71	**4.80**	0.58	**1.80**	0.26	**4.50**	0.71	**8.1**	0.75	**BMDL**	0.81	**12.0**	1.40	**6.82**	0.8
Chromium	**3440.00**	3.60	**12700.00**	2.90	**100.00**	1.30	**5560.00**	3.60	**16400.0**	3.70	**930.00**	4.00	**12600.0**	6.90	**1090**	4
Copper	**40.00**	3.60	**73.00**	2.90	**66.00**	1.30	**25.00**	3.60	**170.0**	3.70	**220.00**	4.00	**250.0**	6.90	**401**	4
Lead	**51.00**	27.00	**140.00**	22.00	**390.00**	9.90	**70.00**	27.00	**1200.0**	28.00	**15500.00**	30.00	**5300.0**	52.00	**156**	30
Mercury	**0.83**	0.29	**1.30**	0.23	**0.19**	0.11	**1.20**	0.29	**1.2**	0.30	**0.98**	0.32	**3.6**	0.55	**24.5**	0.32
Nickel	**14.00**	7.10	**99.00**	5.80	**24.00**	2.60	**65.00**	7.10	**190.0**	7.50	**49.00**	8.10	**110.0**	14.00	**718**	8.1
Selenium	**BMDL**	1.80	**ND**	1.50	**BMDL**	0.66	**ND**	1.80	**ND**	5.90	**BMDL**	2.00	**BMDL**	3.40	**ND**	2
Silver	**BMDL**	3.60	**4.20**	2.90	**ND**	1.30	**5.10**	3.60	**6.0**	3.70	**ND**	4.00	**BMDL**	6.90	**BMDL**	4
Thallium	**ND**	3.60	**ND**	2.90	**ND**	1.30	**ND**	3.60	**ND**	3.70	**ND**	4.00	**ND**	6.90	**ND**	4
Zinc	**98.00**	7.10	**290.00**	5.80	**738.00**	2.60	**170.00**	7.10	**640.0**	7.50	**120.00**	8.10	**1850.0**	14.00	**298**	8.1
Cyanide	**ND**	1.80	**ND**	1.50	**ND**	0.66	**3.86**	1.80	**5.48**	1.80	**ND**	2.00	**10.33**	3.30	**1.5**	1

CONC. – Concentration of compound
D.L. – Detection Limit
ND – Not detected
BMDL – Present below method detection limit, estimated concentration not reported by laboratory

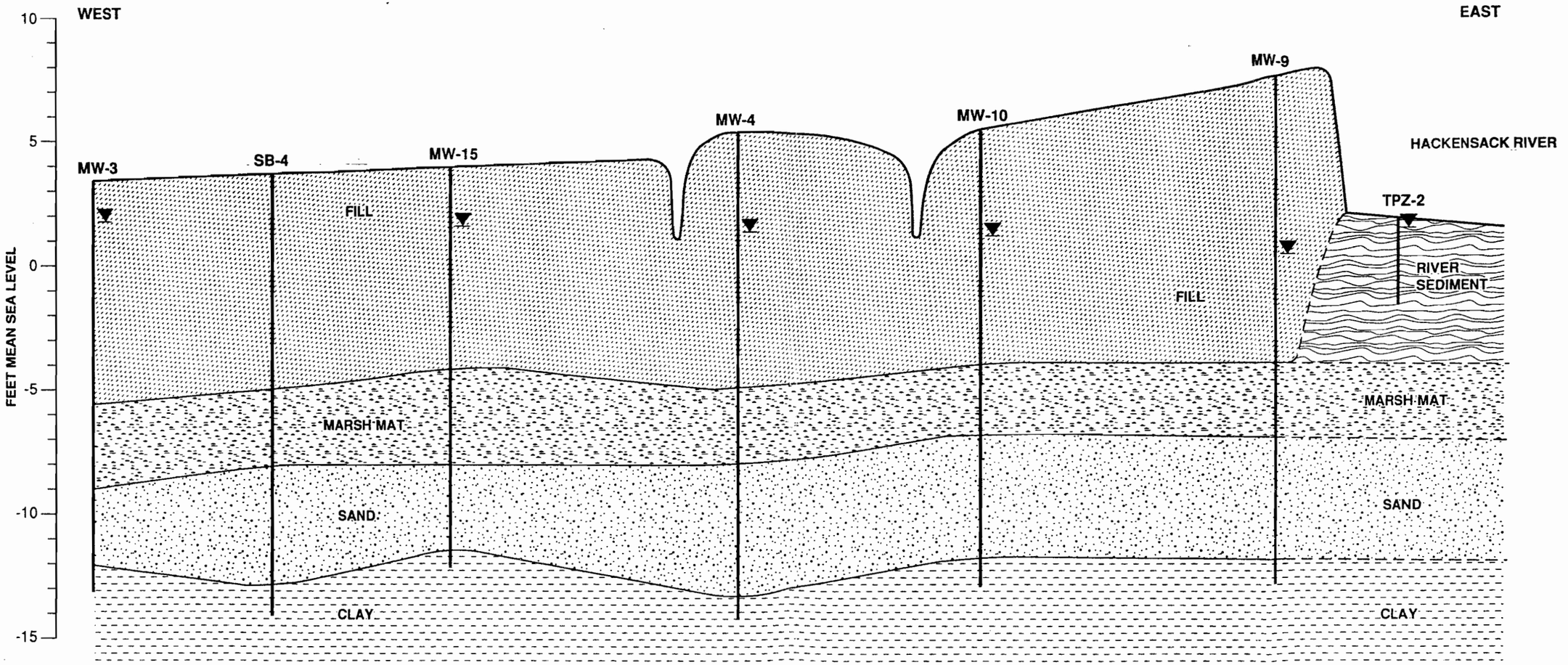
In summary, all of the sampling points indicate impact to surface water and sediments from site-related constituents. The highest concentrations of organics in the sediment are in the drainage area from the center of the site (Figure 5-4). The concentrations of organics in the drainage in the far western portion of the site (S-1, SSW-1) are only somewhat lower than in other portions of the site. No patterns regarding source areas or concentration levels are observed. Since drainage originates at the site, there is no upstream "background" sample. Samples along the southern drainage ditch (S-2, SSW-5 and SSW-2) may be impacted by off-site drainage, however, the analytical results were not qualitatively different from the other samples.

5.4.2 Groundwater

5.4.2.1 Site Geology and Groundwater Flow

Shallow groundwater occurs in granular fill and a thin layer of sediments underlying the site. Twenty new groundwater monitor wells were installed as part of the Remedial Investigation. Boring logs and well construction diagrams are presented in Appendix B. A lithologic cross section based on the RI boring logs is presented in Figure 5-5. The total saturated thickness of sediments underlying the site is approximately 15 ft. The water-bearing zone is underlain by a thick, regionally extensive layer of dense clay. This clay was documented in all site borings and its surface across the site appears regular. Good documentation exists for the regional continuity of the clay from boring logs associated with construction activity and monitor wells and production wells on adjacent and nearby properties.

As discussed in Section 2, shallow groundwater occurs of two zones, an upper zone in the fill material above the marsh mat and a lower zone in the thin sediments between the marsh mat and extensive clay below. Groundwater measurements from the five monitor wells screened in the fill indicate that the marsh mat acts as a partial barrier which retards precipitation infiltrating to the lower zone. In the area of the plant that has been paved



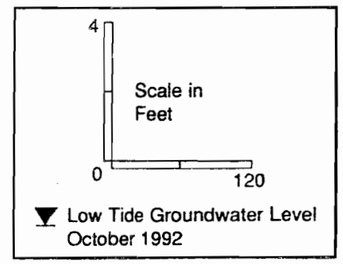


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FIGURE 5-5
EAST-WEST CROSS SECTION OF SHALLOW SEDIMENT STANDARD CHLORINE, KEARNY, NJ

over (MW-15U and 15L) the difference between the elevations of the two water zones is negligible (0.1 ft). Before the paving the difference was up to 0.73 ft. The paving and membrane completely retard recharge to the upper zone which in turn means less recharge to the water zone below the marsh mat.

Tidal fluctuations were measured over an eleven-day period during October 1992 at four locations, MW-4L, MW-5L, MW-9L, and MW-14L, during and between flood and neap stages. Results are plotted on Figure 5-6; they indicate:

- There is no apparent tidal influence at MW-5L which was the well furthest from the river. During the monitoring period, levels in MW-5L varied less than 1 ft.

- The maximum fluctuation in water level was approximately 1.5 ft in MW-4. Fluctuations at MW-4L near the SCCC discharge ditch are irregular and not in tune with tidal cycles.

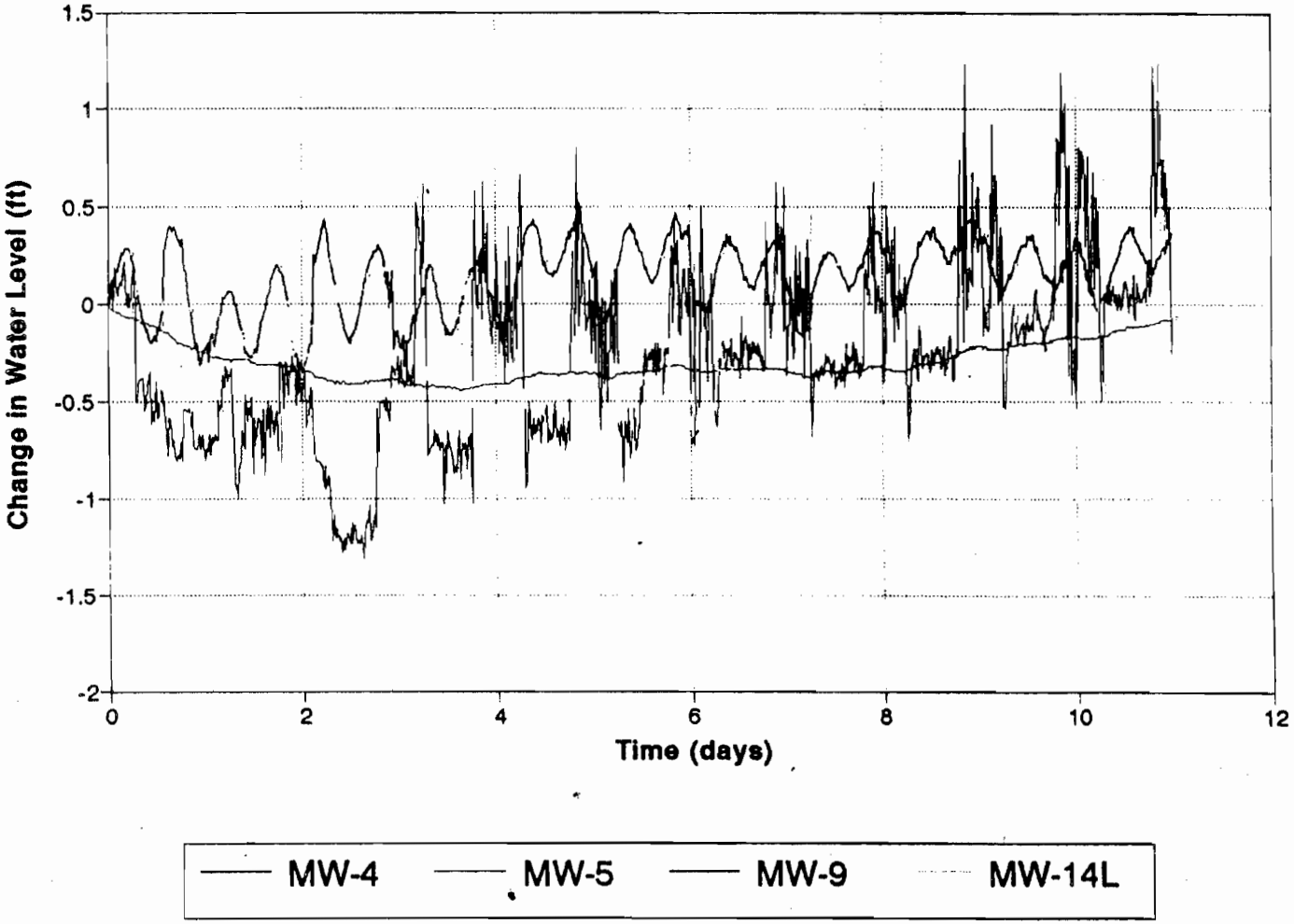
- Tidal influence is regular and consistent in MW-9L in the southeast corner of the site and for the first three days of measurements at MW-14L which is between the lagoons and the river. From day 3 to 11, the pattern of fluctuations at MW-14L takes on a daily fluctuation.

During the period of the monitoring, no precipitation was recorded, although there was a significant amount of rainfall the day before the monitoring was started.

The mean groundwater elevation was calculated from the data collected from the four wells during the tidal study to produce a groundwater contour map (Figure 5-7). Using the mean groundwater elevation is useful to calculate average flow from the site to a discharge area (Serfes, 1991). From these contours, the average gradient is .0011 toward

FIGURE 5-6

Tidal Fluctuations On Observed Wells



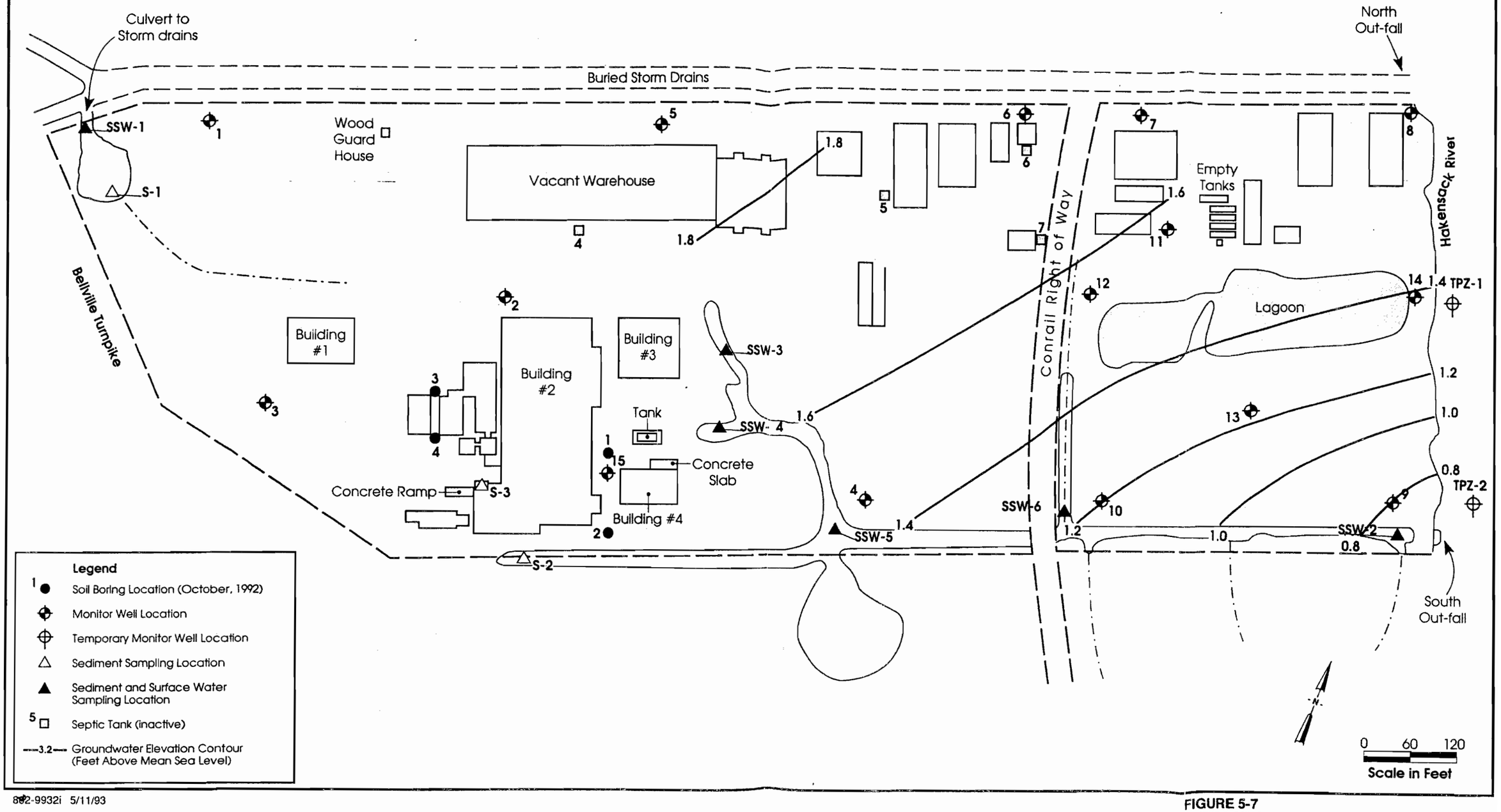


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FIGURE 5-7
AVERAGE GROUNDWATER FLOW CONTOURS, LOWER MONITOR WELLS STANDARD CHLORINE, KEARNY, NJ

the southeast. There is no net reversal in gradient and the average gradient is similar to the gradient observed at low tide.

Slug tests were performed on monitor wells MW-3, 4, 5, 6, 8, 9, 13L, and 14L. The slug test data were used to calculate hydraulic conductivity, K, in the lower zone. Table 5-9 is a summary of the slug test results. Appendix C contains the well specifications, computations, and graphical results. Hydraulic conductivities (both falling and rising head) range from 0.26 to 12.63 ft per day averaging 5.34 ft per day.

Figure 5-8 presents groundwater elevation contours across the SCCC site based on elevations taken during low tide on 9 October 1992 (Table 5-10). The contours are based on a geometric interpolation between wells in the natural sand zone. Staff gauges in the ditches were used to determine surface water elevation at three points along the south ditch. The lagoons were only partially submerged during this period, and no attempt was made to merge the lagoon surface into the contours.

The contours present the same picture overall as the contour map based on mean elevations ((Figure 5-8), except that the additional measuring points reveal more detail. Low tide is the period where maximum gradients toward the river would be expected. The major observations from Figure 5-8 regarding groundwater flow are:

- The major component of flow from the area west and south of the lagoon is to the south, toward the drainage ditch. There is a minor component of flow toward the river.

- The flow gradient in the northeast corner indicates flow from the old process area north of the lagoon is toward the northeast corner of the site. A mounding appears in the northeast portion of the site associated with

Table 5-9

Summary of Results of Slug Testing
SCCC, Kearny, NJ

Monitor Well	RISING HEAD Hydraulic Conductivity (ft/day)	FALLING HEAD Hydraulic Conductivity (ft/day)
MW-3	1.25	5.88
MW-4	12.40	12.63
MW-5	5.45	9.33
MW-6	0.26	2.12
MW-8	1.15	3.02
MW-9	8.97	11.93
MW-13	1.08	3.09
MW-14	1.89	4.99

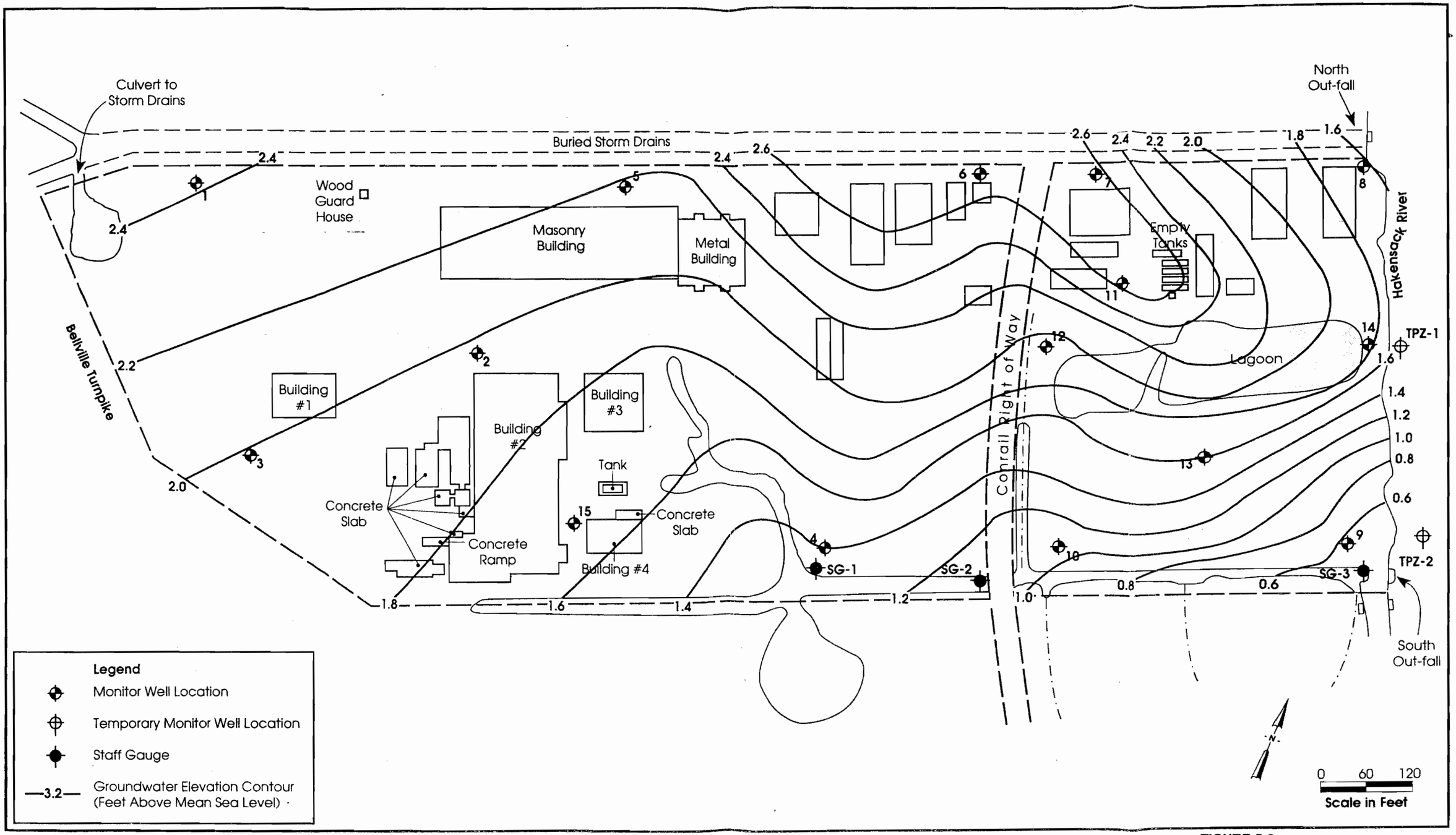

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FIGURE 5-8
GROUNDWATER FLOW CONTOURS, (LOW TIDE) LOWER MONITOR WELLS STANDARD CHLORINE, KEARNY, NJ

TABLE 5-10
GROUNDWATER ELEVATIONS FOR SHALLOW MONITOR WELLS
SCCC, KEARNY, NJ

						LOW TIDE		HIGH TIDE	
LOWER MONITOR WELLS	TOP OF CASING ELEV(1)	14 JAN 91 D.T.W.	14 JAN 91 G.W. ELEV(1)	31 JAN 91 D.T.W.	31 JAN 91 G.W. ELEV(1)	06 OCT 92 D.T.W.	06 OCT 92 G.W. ELEV(1)	13 OCT 92 D.T.W.	13 OCT 92 G.W. ELEV(1)
MW-1L	8.54	5.54	3.00	5.65	2.89	6.18	2.36	6.08	2.46
MW-2L	7.36	4.32	3.04	4.93	2.43	5.33	2.03	5.17	2.19
MW-3L	5.29	2.34	2.95	2.69	2.60	3.37	1.92	3.42	1.87
MW-4L	7.28	4.51	2.77	5.48	1.80	5.90	1.38	5.77	1.51
MW-5L	6.14	3.15	2.99	3.31	2.83	3.91	1.38	3.80	2.34
MW-6L	6.82	4.89	1.93	3.85	2.97	4.13	2.69	4.15	2.67
MW-7L	6.90	3.24	3.66	4.08	2.82	4.34	2.56	4.18	2.72
MW-8L	8.58	6.62	1.96	6.13	2.45	6.98	1.60	6.32	2.26
MW-9L	10.09	10.22	-0.13	8.65	1.44	9.56	0.53	9.11	0.98
MW-10L	8.12	6.60	1.52	6.77	1.35	7.00	1.12	6.76	1.36
MW-11L	7.88	4.24	3.64	4.77	3.11	5.20	2.68	5.12	2.76
MW-12L	6.99	4.46	2.53	4.46	2.53	5.12	1.87	4.73	2.26
MW-13L	11.59	10.51	1.08	13.35	-1.76	10.00	1.59	9.87	1.72
MW-14L	7.99	6.31	1.68	5.75	2.24	6.20	1.80	5.73	2.26
MW-15L	6.40	4.26	2.14	4.33	2.07	4.73	1.67	4.60	1.80
UPPER MONITOR WELLS									
MW-11U	7.20	3.16	4.04	3.28	3.92	3.99	3.31	4.03	3.17
MW-12U	8.13	4.01	4.12	4.19	3.94	5.77	2.36	5.73	2.40
MW-13U	11.25	6.71	4.54	9.77	1.48	7.68	3.57	7.75	3.50
MW-14U	8.27	4.01	4.26	3.71	4.56	5.06	3.21	5.14	3.13
MW-15U	6.44	3.57	2.87	3.77	2.67	4.67	1.77	4.36	2.08
STAFF GAUGES									
SG #1	2.57	—	—	—	—	1.34	1.23	1.35	1.22
SG #2	2.42	—	—	—	—	1.64	0.78	1.60	0.82
SG #3	0.95	—	—	—	—	0.64	0.31	0.70	0.25
SG #4	2.24	—	—	—	—	—	—	+0.95(2)	3.19
TEMPORARY WELLS									
TPZ-1	4.40	—	—	—	—	2.36	2.04	—	—
TPZ-2	3.74	—	—	—	—	2.17	1.57	—	—

DTW - Depth to water
(1) - Feet above mean sea level (MSL)
(2) - Feet above measuring point

MW-6L, MW-7L, and MW-11L. Leakage from the storm drain may explain this anomaly.

- The average gradient across the site at low tide is .0011 (based on the gradient between MW-1L and MW-9L). This is also the "average" gradient calculated from the tidal monitoring.

- For water-bearing sediment of the same thickness, reducing recharge reduces the gradient. Gradients are lower in the western half of the site. This was the case even before the area was capped, probably because a large portion of the area was paved or covered by buildings.

5.4.2.2 Groundwater Quality

During Phase I of the RI, 20 monitor wells (five upper and 15 lower) were installed and sampled. The samples were analyzed for VOCs, BNAs, metals (including hexavalent chromium), cyanide, and phenolics. The results (Figures 5-9, 5-10 and Table 5-11) indicate:

- Benzene, toluene, ethylbenzene, chlorobenzene were the main VOC contaminants found. Elevated levels of trichloroethene (TCE) and tetrachloroethene (PCE) were found in some wells.

- Lead was detected at elevated concentrations in six wells in the eastern portion of the site. Chromium was detected in all monitor wells. Hexavalent chrome was detected in four of five upper zone monitor wells (12U, 13U, 14U and 15U) and in none of the lower wells. Cyanide was detected in many of the wells at low concentrations (at levels below NJDEPE guidelines).

TABLE 5-11
SUMMARY OF PHASE I GROUNDWATER ANALYTICAL DATA
VOLATILES AND SEMIVOLATILES
SCCC, KEARNY, NJ

LAB NUMBER	HA3935		HA3936		HA3941		HA3937		HA3944		HA3943		HA3940		HA3942		HA3945		HA3938	
SAMPLE NUMBER	MW-1L		MW-1LDUP		MW-2L		MW-3L		MW-4L		MW-5L		MW-6L		MW-7L		MW-8L		MW-9L	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
VOC's (ug/L)																				
Methyl chloride	ND	10.0	ND	10.0	ND	250	ND	10.0	ND	1000	ND	250	ND	100	ND	250	ND	500	BMDL	20.0
Dichlorodifluoromethane	ND	10.0	ND	10.0	ND	250	10.6	10.0	ND	1000	ND	250	ND	100	ND	250	ND	500	ND	20.0
Vinyl chloride	ND	10.0	ND	10.0	ND	250	ND	10.0	ND	1000	ND	250	ND	100	ND	250	669	500	ND	20.0
Methylene chloride	ND	2.8	ND	2.8	81.4	70	ND	2.8	415	280	ND	70	38.8-B	28	79.8	70	223	140-B	ND	5.6
1,2-Trans-dichloroethylene	ND	1.6	ND	1.6	ND	40	ND	1.6	ND	160	ND	40	ND	16	ND	40	244	80	ND	3.2
Trichloroethylene	ND	1.9	ND	1.9	ND	48	ND	1.9	ND	190	ND	48	ND	19	BMDL	48	5270	95	ND	3.8
bis(Chloromethyl)ether	ND	10.0	ND	10.0	ND	250	ND	10.0	ND	1000	ND	250	ND	100	ND	250	ND	500	ND	20.0
Benzene	ND	4.4	ND	4.4	190	110	BMDL	4.4	519	440	BMDL	110	534	44	501	110	388	220	31.1	8.8
Tetrachloroethylene	ND	4.1	ND	4.1	ND	100	ND	4.1	ND	410	ND	100	ND	41	ND	100	1590	210	ND	8.2
Toluene	ND	6.0	ND	6.0	BMDL	150	ND	6.0	ND	600	ND	150	912	60	1190	150	ND	300	14.6	12.0
Chlorobenzene	ND	6.0	ND	6.0	882	150	65.1	6.0	1230	600	414	150	BMDL	60	ND	150	3060	300	ND	12.0
Ethylbenzene	ND	7.2	ND	7.2	ND	180	ND	7.2	ND	720	ND	180	309	72	243	180	ND	360	ND	14.0
BNA's (ug/L)																				
Phenol	ND	1.6	ND	1.7	73.5	1.8	ND	1.8	1320	8.9	ND	16	888	8.2	53700	17	3600	37	68700	86
2-Chlorophenol	ND	3.6	ND	3.7	ND	4	ND	3.9	ND	20	ND	36	ND	18	ND	38	ND	80	ND	190
2,4-Dimethylphenol	ND	2.9	ND	3	3.82	3.3	ND	3.2	5400	16	ND	29	28500	15	83200	31	581	66	7930	160
2,4-Dichlorophenol	ND	2.9	ND	3	99	3.3	145	3.2	77.3	16	142	29	ND	15	ND	31	ND	66	ND	160
2,4,6-Trichlorophenol	ND	2.9	ND	3	ND	3.3	ND	3.2	ND	16	ND	29	ND	15	ND	31	ND	66	ND	160
1,3-Dichlorobenzene	ND	2.1	ND	2.1	18500	2.3	24600	2.2	26900	11	6030	21	ND	10	152	22	12500	46	ND	110
1,4-Dichlorobenzene	BMDL	4.8	BMDL	4.9	21900	5.3	29500	5.2	29200	26	10400	48	ND	24	279	50	12300	110	ND	250
1,2-Dichlorobenzene	2.58	2.1	BMDL	2.1	19600	2.3	30300	2.2	28100	11	9650	21	ND	10	1570	22	13800	46	ND	110
1,2,4-Trichlorobenzene	ND	2.1	ND	2.1	89.6	2.3	127	2.2	107	11	ND	21	ND	10	ND	22	14400	46	ND	110
Naphthalene	ND	1.7	ND	1.8	111	1.9	55.8	1.9	70.8	9.5	19.6	17	12700	8.7	23700	18	4970	39	58200	92
Acenaphthylene	ND	3.8	ND	3.9	ND	4.2	ND	4.1	ND	21	ND	38	52.9	19	96.3	40	ND	85	ND	200
Acenaphthene	ND	2.1	ND	2.1	6.43	2.3	ND	2.2	BMDL	11	ND	21	264	10	548	22	BMDL	46	2910	110
Fluorene	ND	2.1	ND	2.1	5.51	2.3	ND	2.2	ND	11	ND	21	136	10	303	22	ND	46	ND	110
Hexachlorobenzene	ND	2.1	ND	2.1	ND	2.3	ND	2.2	ND	11	ND	21	ND	10	ND	22	ND	46	ND	110
Phenanthrene	ND	5.9	ND	6.1	BMDL	6.5	ND	6.4	ND	32	ND	59	68.8	29	216	61	ND	130	ND	310
Anthracene	ND	2.1	ND	2.1	ND	2.3	ND	2.2	ND	11	ND	21	23.4	10	69.3	22	ND	46	ND	110
Fluoranthene	ND	2.4	ND	2.5	ND	2.7	ND	2.6	ND	13	ND	24	ND	12	29.7	25	ND	54	ND	130
Pyrene	ND	2.1	ND	2.1	ND	2.3	ND	2.2	ND	11	ND	21	ND	10	BMDL	22	ND	46	ND	110
bis(2-Ethylhexyl)phthalate	ND	11	ND	11	ND	12	ND	12	ND	60	ND	110	11100	54	ND	110	ND	240	ND	570
Phenolics	ND	0.05	ND	0.05	ND	0.05	ND	0.05	6	0.05	0.051	0.05	13	0.05	154	0.05	4	0.05	510	0.05

CONC. – Concentration of Compound
D.L. – Detection Limit
NA – Not analyzed
ND – Not detected
BMDL – Present below detection limit, estimated concentration not reported by laboratory
B – Compound also detected in laboratory blanks

TABLE 5-11 (Continued)
SUMMARY OF PHASE I GROUNDWATER ANALYTICAL DATA
VOLATILES AND SEMIVOLATILES
SCCC, KEARNY, NJ

LAB NUMBER	HA3939		HA3958		HA3952		HA3950		HA3955		HA3957		HA3954		HA3956		HA3953		HA3951		HA3946	
SAMPLE NUMBER	MW-10L		MW-11L		MW-11U		MW-12L		MW-12U		MW-13L		MW-13U		MW-14L		MW-14U		MW-15L		MW-15U	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
VOC's (ug/L)																						
Methyl chloride	ND	100	ND	200	ND	200	ND	250	ND	200	267	200	ND	10.0	ND	10.0	ND	10.0	ND	1000	ND	10.0
Dichlorodifluoromethane	ND	100	ND	200	ND	200	ND	250	ND	200	ND	200	ND	10.0	ND	10.0	ND	10.0	ND	1000	ND	10.0
Vinyl chloride	ND	100	ND	200	ND	200	ND	250	ND	200	ND	200	ND	10.0	ND	10.0	ND	10.0	ND	1000	ND	10.0
Methylene chloride	38.9-B	28	73.3	56	ND	56	ND	70	101	100	ND	56	ND	2.8	ND	2.8	BMDL	2.8	ND	289	ND	2.8
1,2-Trans-dichloroethylene	ND	16	ND	32	174	32	ND	40	ND	100	ND	32	ND	1.6	ND	1.6	ND	1.6	ND	160	ND	1.6
Trichloroethylene	ND	19	173	38	96	38	108	48	ND	100	79	38	ND	1.9	121	1.9	ND	1.9	ND	190	ND	1.9
bis(Chloromethyl)ether	ND	100	ND	200	ND	200	ND	250	ND	200	ND	200	ND	10.0	ND	10.0	ND	10.0	ND	1000	ND	10.0
Benzene	108	44	467	88	353	88	337	110	ND	100	118	88	BMDL	4.4	131	4.4	4.59	4.4	3010	440	ND	4.4
Tetrachloroethylene	ND	41	BMDL	82	96.7	82	ND	100	ND	100	BMDL	82	ND	4.1	74.1	4.1	ND	4.1	ND	410	ND	4.1
Toluene	108	60	BMDL	120	BMDL	120	1290	150	ND	100	BMDL	120	BMDL	6.0	115	6.0	20.7	6.0	ND	600	ND	6.0
Chlorobenzene	111	60	1110	120	796	120	743	150	ND	100	200	120	ND	6.0	134	6.0	ND	6.0	1830	600	ND	6.0
Ethylbenzene	BMDL	72	ND	140	ND	140	240	180	ND	100	ND	140	ND	7.2	21.1	7.2	51.1	7.2	ND	720	ND	7.2
BNA's (ug/L)																						
Phenol	ND	16	19100	33	445	1.6	42600	82	6.62	1.7	210000	18	19300	1.7	33500	84	ND	1.7	783	1.7	ND	1.6
2-Chlorophenol	ND	36	ND	73	ND	3.6	ND	180	ND	3.7	ND	39	ND	3.7	ND	190	ND	3.7	63.3	3.7	ND	3.6
2,4-Dimethylphenol	25900	30	1180	59	1830	2.9	20900	150	33.7	3	22800	32	808	3	17500	150	53.3	3	ND	3	ND	3
2,4-Dichlorophenol	ND	30	ND	59	ND	2.9	ND	150	ND	3	ND	32	ND	3	ND	150	ND	3	321	3	ND	3
2,4,6-Trichlorophenol	ND	30	ND	59	ND	2.9	ND	150	15.5	3	ND	32	ND	3	ND	150	ND	3	ND	3	ND	3
1,3-Dichlorobenzene	60.4	21	1570	42	892	2.1	1130	100	65.9	2.1	239	22	25.4	2.1	2650	110	4.1	2.1	15200	2.1	78.6	2.1
1,4-Dichlorobenzene	110	48	2310	97	1910	4.8	2560	240	141	4.9	497	52	51.7	4.9	4610	250	9.56	4.9	19500	4.9	109	4.8
1,2-Dichlorobenzene	156	21	6650	42	5250	2.1	5290	100	145	2.1	771	22	74.2	2.1	2780	110	5.2	2.1	20600	2.1	140	2.1
1,2,4-Trichlorobenzene	ND	21	6070	42	5400	2.1	1520	100	128	2.1	3520	22	166	2.1	14000	110	41.8	2.1	81.2	2.1	ND	2.1
Naphthalene	4990	18	7150	35	9660	1.7	11700	87	426	1.8	16400	19	5020	1.8	5020	90	6540	1.8	20.4	1.8	ND	1.8
Acenaphthylene	ND	38	ND	77	ND	3.8	BMDL	190	8.7	3.9	ND	41	ND	3.9	ND	200	6.88	3.9	ND	3.9	ND	3.8
Acenaphthene	33.7	21	ND	42	22.4	2.1	104	100	117	2.1	308	22	25.5	2.1	ND	110	238	2.1	ND	2.1	ND	2.1
Fluorene	ND	21	ND	42	19.3	2.1	BMDL	100	39.7	2.1	ND	22	2.9	2.1	ND	110	57.8	2.1	ND	2.1	ND	2.1
Hexachlorobenzene	ND	21	ND	42	ND	2.1	BMDL	100	ND	2.1	ND	22	ND	2.1	ND	110	ND	2.1	ND	2.1	ND	2.1
Phenanthrene	ND	59	ND	120	15.9	5.9	BMDL	290	41.1	6	ND	64	BMDL	6.1	ND	300	27	6	ND	6	ND	5.9
Anthracene	ND	21	ND	42	9.66	2.1	ND	100	3.63	2.1	ND	22	ND	2.1	ND	110	4.2	2.1	ND	2.1	ND	2.1
Fluoranthene	ND	24	ND	48	ND	2.4	ND	120	4.26	2.4	ND	26	ND	2.5	ND	120	BMDL	2.4	ND	2.4	ND	2.4
Pyrene	ND	21	ND	42	ND	2.1	ND	100	2.1	2.1	ND	22	ND	2.1	ND	110	BMDL	2.1	ND	2.1	ND	2.1
bis(2-Ethylhexyl)phthalate	ND	110	ND	220	ND	11	ND	540	ND	11	ND	120	ND	11	ND	560	ND	11	ND	11	588	11
Phenolics	3620	0.05	96	0.05	5	0.05	110	0.05	NA	NA	2660	0.05	NA	NA	57	0.05	0.17	0.05	ND	0.05	ND	0.05

CONC. – Concentration of Compound
D.L. – Detection Limit
NA – Not analyzed
ND – Not detected
BMDL – Present below detection limit, estimated concentration not reported by laboratory
B – Compound also detected in laboratory blanks

TABLE 5-11 (Continued)
SUMMARY OF PHASE I GROUNDWATER ANALYTICAL DATA
VOLATILES AND SEMIVOLATILES
SCOC, KEARNY, NJ

LAB NUMBER	HA3948		HA3947		HA3959		HA3961		HA3960		HA3963		HA3962	
SAMPLE NUMBER	FB-1		FB-2		FB-3		TB-1		TB-2		TB-3		TRIP BLANK	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
VOC's (ug/L)														
Methyl chloride	ND	10.0	ND	10.0	ND	10.0	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Dichlorodifluoromethane	ND	10.0	ND	10.0	ND	10.0	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Vinyl chloride	ND	10.0	ND	10.0	ND	10.0	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Methylene chloride	3.11-B	2.8	2.91-B	2.8	ND	2.8	3.5-B	2.8	3.55-B	2.8	ND	2.8	ND	2.8
1,2-Trans-dichloroethylene	ND	1.6	ND	1.6	ND	1.6	ND	1.6	ND	1.6	ND	1.6	ND	1.6
Trichloroethylene	ND	1.9	ND	1.9	ND	1.9	ND	1.9	ND	1.9	ND	1.9	ND	1.9
bis(Chloromethyl)ether	ND	10.0	ND	10.0	ND	10.0	ND	10.0	ND	10.0	ND	10.0	ND	10.0
Benzene	ND	4.4	ND	4.4	ND	4.4	ND	4.4	ND	4.4	ND	4.4	ND	4.4
Tetrachloroethylene	ND	4.1	ND	4.1	ND	4.1	ND	4.1	ND	4.1	ND	4.1	ND	4.1
Toluene	BMDL-B	6.0	ND	6.0	ND	6.0	ND	6.0	ND	6.0	ND	6.0	ND	6.0
Chlorobenzene	ND	6.0	ND	6.0	ND	6.0	ND	6.0	ND	6.0	ND	6.0	ND	6.0
Ethylbenzene	ND	7.2	ND	7.2	ND	7.2	ND	7.2	ND	7.2	ND	7.2	ND	7.2
BNA's (ug/L)														
Phenol	ND	1.6	ND	2	ND	1.6								
2-Chlorophenol	ND	3.6	ND	4.5	ND	3.5								
2,4-Dimethylphenol	ND	2.9	ND	3.6	ND	2.8								
2,4-Dichlorophenol	ND	2.9	ND	3.6	ND	2.8								
2,4,6-Trichlorophenol	ND	2.9	ND	3.6	ND	2.8								
1,3-Dichlorobenzene	ND	2.1	ND	2.6	ND	2								
1,4-Dichlorobenzene	ND	4.8	ND	5.9	ND	4.6								
1,2-Dichlorobenzene	ND	2.1	ND	2.6	ND	2								
1,2,4-Trichlorobenzene	ND	2.1	ND	2.6	ND	2								
Naphthalene	ND	1.7	ND	2.2	ND	1.7								
Acenaphthylene	ND	3.8	ND	4.7	ND	3.7								
Acenaphthene	ND	2.1	ND	2.6	ND	2								
Fluorene	ND	2.1	ND	2.6	ND	2								
Hexachlorobenzene	ND	2.1	ND	2.6	ND	2								
Phenanthrene	ND	5.9	ND	7.3	ND	5.7								
Anthracene	ND	2.1	ND	2.6	ND	2								
Fluoranthene	ND	2.4	ND	3	ND	2.3								
Pyrene	ND	2.1	ND	2.6	ND	2								
bis(2-Ethylhexyl)phthalate	ND	11	ND	14	ND	11								
Phenolics	ND	0.05	ND	0.05	ND	0.05								

CONC.- Concentration of Compound
D.L. - Detection Limit
NA - Not analyzed
ND - Not detected
BMDL- Present below detection limit, estimated concentration not reported by laboratory
B - Compound also detected in laboratory blanks

TABLE 5-11 (Continued)
SUMMARY OF PHASE I GROUNDWATER ANALYTICAL DATA
METALS
SCCC, KEARNY, NJ

LAB NUMBER	HA3935		HA3936		HA3941		HA3937		HA3944		HA3943		HA3940	
SAMPLE NUMBER	MW-1L		MW-1LDUP		MW-2L		MW-3L		MW-4L		MW-5L		MW-6L	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
Metals (mg/L)														
Antimony	ND	0.06	ND	0.06	ND	0.06	ND	0.06	ND	0.06	ND	0.06	ND	0.06
Arsenic	BMDL	0.05	BMDL	0.05	0.047	0.01	0.13	0.01	0.02	0.02	0.1	0.01	0.042	0.01
Beryllium	0.0014	0.001	0.0013	0.001	ND	0.001	ND	0.001	0.0022	0.001	0.0029	0.001	BMDL	0.001
Cadmium	ND	0.002	ND	0.002	ND	0.002	ND	0.002	ND	0.002	0.0023	0.002	ND	0.002
Chromium	1.87	0.01	1.37	0.01	0.039	0.01	0.014	0.01	1.4	0.01	1.89	0.01	0.18	0.01
Copper	0.026	0.01	0.021	0.01	0.015	0.01	0.011	0.01	0.015	0.01	0.046	0.01	0.014	0.01
Lead	ND	0.075	ND	0.075	BMDL	0.075	ND	0.075	BMDL	0.075	BMDL	0.075	ND	0.075
Mercury	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002	ND	0.0002
Nickel	0.027	0.02	0.028	0.02	BMDL	0.02	BMDL	0.02	0.045	0.02	0.023	0.02	0.023	0.02
Selenium	BMDL	0.025	BMDL	0.005	ND	0.005	ND	0.005	ND	0.01	ND	0.025	BMDL	0.005
Silver	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	BMDL	0.01	BMDL	0.01
Thallium	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01	ND	0.01
Zinc	0.037	0.02	0.034	0.02	BMDL	0.02	BMDL	0.02	0.05	0.02	0.068	0.02	0.074	0.02
Chromium, Hexavalent	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.01	ND	0.01
Cyanide	0.034	0.025	ND	0.025	ND	0.025	0.035	0.025	ND	0.025	0.08	0.025	0.058	0.025

CONC. – Concentration of Compound
D.L. – Detection Limit
ND – Not detected
BMDL – Present below detection limit, estimated concentration not reported by laboratory

TABLE 5-11 (Continued)
SUMMARY OF PHASE I GROUNDWATER ANALYTICAL DATA
METALS
SCCC, KEARNY, NJ

LAB NUMBER	HA3942		HA3945		HA3938		HA3939		HA3958		HA3952		HA3950	
SAMPLE NUMBER	MW-7L		MW-8L		MW-9L		MW-10L		MW-11L		MW-11U		MW-12L	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
Metals (mg/L)														
Antimony	**ND**	0.06	**ND**	0.06	**ND**	0.06	**ND**	0.06	**ND**	0.06	**0.39**	0.06	**ND**	0.06
Arsenic	**BMDL**	0.05	**BMDL**	0.02	**BMDL**	0.25	**BMDL**	0.05	**0.066**	0.01	**0.13**	0.01	**BMDL**	0.05
Beryllium	**0.0028**	0.001	**0.0021**	0.001	**0.145**	0.001	**0.017**	0.001	**0.003**	0.001	**0.0026**	0.001	**0.0028**	0.001
Cadmium	**ND**	0.002	**ND**	0.002	**ND**	0.01	**ND**	0.004	**0.013**	0.002	**0.014**	0.002	**0.01**	0.002
Chromium	**0.87**	0.01	**0.71**	0.01	**15.8**	0.01	**4.91**	0.01	**1.16**	0.01	**6.64**	0.01	**0.17**	0.01
Copper	**0.018**	0.01	**0.064**	0.01	**0.57**	0.01	**0.051**	0.01	**0.037**	0.01	**0.9**	0.01	**0.019**	0.01
Lead	**ND**	0.075	**BMDL**	0.075	**0.61**	0.075	**0.14**	0.075	**0.34**	0.075	**12.5**	0.075	**BMDL**	0.075
Mercury	**ND**	0.0002	**ND**	0.0002	**ND**	0.0002	**ND**	0.0002	**0.00041**	0.0002	**0.142**	0.0002	**0.00023**	0.0002
Nickel	**0.067**	0.02	**0.026**	0.02	**6.74**	0.02	**0.93**	0.02	**0.46**	0.02	**0.48**	0.02	**0.3**	0.02
Selenium	**ND**	0.005	**ND**	0.005	**ND**	0.025	**ND**	0.025	**ND**	0.005	**ND**	0.025	**ND**	0.05
Silver	**ND**	0.01	**ND**	0.01	**BMDL**	0.01	**BMDL**	0.01	**BMDL**	0.01	**BMDL**	0.01	**BMDL**	0.01
Thallium	**ND**	0.01	**ND**	0.01	**BMDL**	0.01	**ND**	0.01	**ND**	0.01	**ND**	0.01	**ND**	0.01
Zinc	**0.039**	0.02	**0.046**	0.02	**11.9**	0.02	**1.3**	0.02	**0.54**	0.02	**0.55**	0.02	**0.31**	0.02
Chromium, Hexavalent	**ND**	0.5	**ND**	0.05	**ND**	0.5	**ND**	0.05	**ND**	0.01	**ND**	0.05	**ND**	0.01
Cyanide	**0.092**	0.025	**0.037**	0.025	**0.028**	0.025	**0.067**	0.025	**0.055**	0.025	**0.197**	0.025	**0.07**	0.025

CONC. – Concentration of Compound
D.L. – Detection Limit
ND – Not detected
BMDL – Present below detection limit, estimated concentration not reported by laboratory

TABLE 5-11 (Continued)
SUMMARY OF PHASE I GROUNDWATER ANALYTICAL DATA
METALS
SCCC, KEARNY, NJ

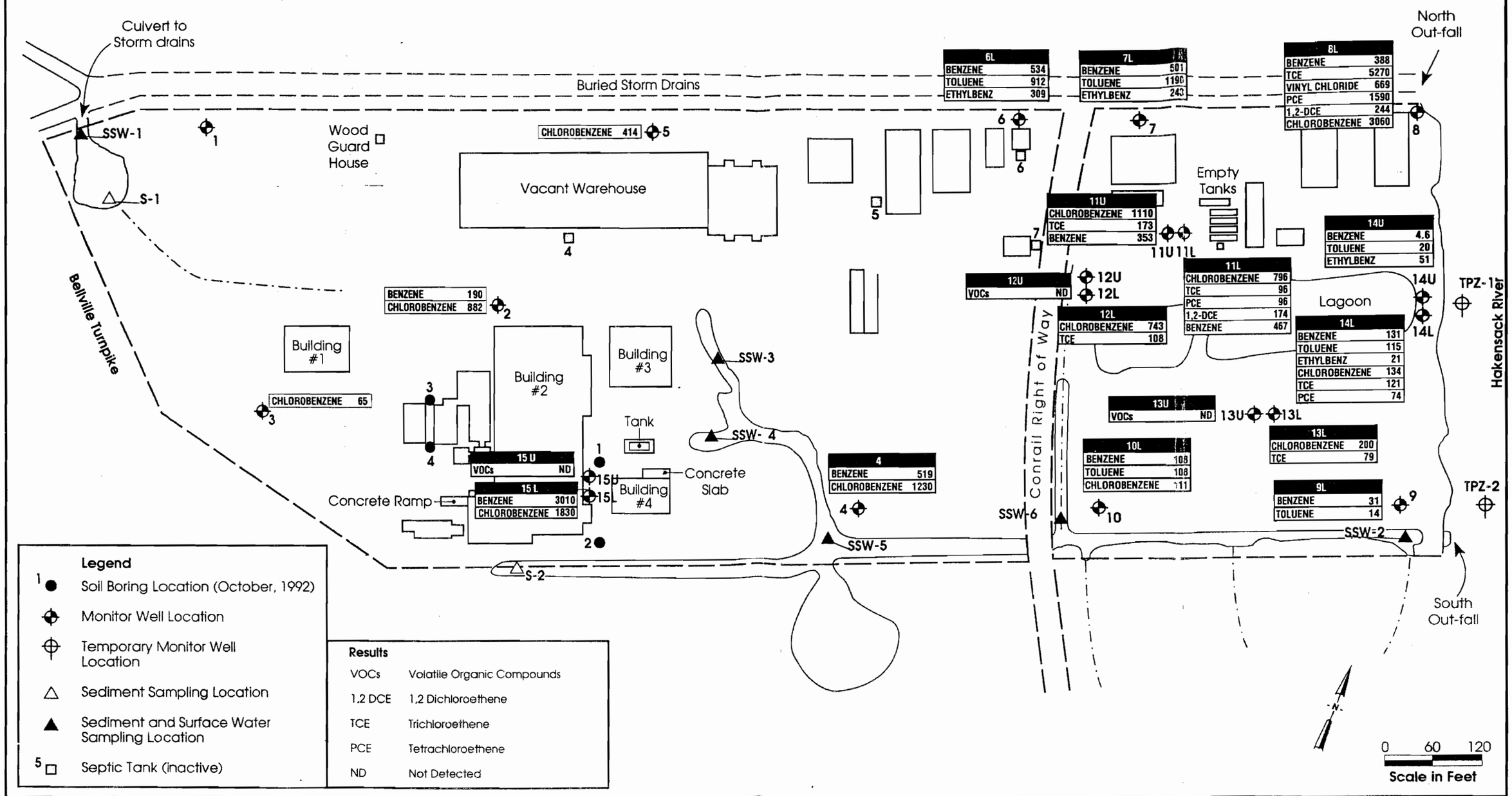
LAB NUMBER	HA3955		HA3957		HA3954		HA3956		HA3953		HA3951		HA3946	
SAMPLE NUMBER	MW-12U		MW-13L		MW-13U		MW-14L		MW-14U		MW-15L		MW-15U	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
Metals (mg/L)														
Antimony	**BMDL**	0.06	**0.19**	0.06	**0.062**	0.06	**ND**	0.06	**0.18**	0.06	**ND**	0.06	**0.11**	0.06
Arsenic	**BMDL**	0.01	**BMDL**	0.1	**ND**	0.01	**BMDL**	0.05	**0.035**	0.01	**BMDL**	0.01	**0.024**	0.01
Beryllium	**BMDL**	0.001	**0.033**	0.001	**BMDL**	0.001	**0.0054**	0.001	**0.0019**	0.001	**BMDL**	0.001	**0.0031**	0.001
Cadmium	**0.0055**	0.002	**0.17**	0.002	**BMDL**	0.002	**0.021**	0.002	**0.0076**	0.002	**0.01**	0.002	**0.0081**	0.002
Chromium	**2.3**	0.01	**67.3**	0.01	**7.15**	0.01	**0.9**	0.01	**20.3**	0.01	**0.023**	0.01	**4.2**	0.01
Copper	**0.077**	0.01	**0.35**	0.01	**0.022**	0.01	**0.058**	0.01	**0.23**	0.01	**0.021**	0.01	**0.26**	0.01
Lead	**0.6**	0.075	**0.35**	0.075	**ND**	0.075	**0.11**	0.075	**2.6**	0.075	**0.82**	0.075	**44.9**	0.075
Mercury	**0.0014**	0.0002	**BMDL**	0.0002	**0.00033**	0.0002	**0.00023**	0.0002	**0.0347**	0.0002	**ND**	0.0002	**0.00087**	0.0002
Nickel	**0.22**	0.02	**2.95**	0.02	**0.029**	0.02	**0.51**	0.02	**0.36**	0.02	**ND**	0.02	**0.13**	0.02
Selenium	**ND**	0.005	**BMDL**	0.025	**ND**	0.005	**ND**	0.005	**ND**	0.025	**ND**	0.025	**ND**	0.025
Silver	**ND**	0.01	**BMDL**	0.01	**ND**	0.01	**BMDL**	0.01	**BMDL**	0.01	**ND**	0.01	**BMDL**	0.01
Thallium	**ND**	0.01	**BMDL**	0.01	**ND**	0.01	**ND**	0.01	**ND**	0.01	**ND**	0.01	**ND**	0.01
Zinc	**0.22**	0.02	**2.53**	0.02	**0.028**	0.02	**0.49**	0.02	**0.64**	0.02	**0.054**	0.02	**0.62**	0.02
Chromium, Hexavalent	**0.081**	0.01	**ND**	0.05	**7.38**	0.01	**ND**	0.01	**3.32**	0.01	**ND**	0.01	**0.088**	0.01
Cyanide	**ND**	0.025	**ND**	0.025	**0.025**	0.025	**0.073**	0.025	**0.031**	0.025	**ND**	0.025	**ND**	0.025

CONC. – Concentration of Compound
D.L. – Detection Limit
ND – Not detected
BMDL – Present below detection limit, estimated concentration not reported by laboratory

TABLE 5-11 (Continued)
SUMMARY OF PHASE I GROUNDWATER ANALYTICAL DATA
METALS
SCCC, KEARNY, NJ

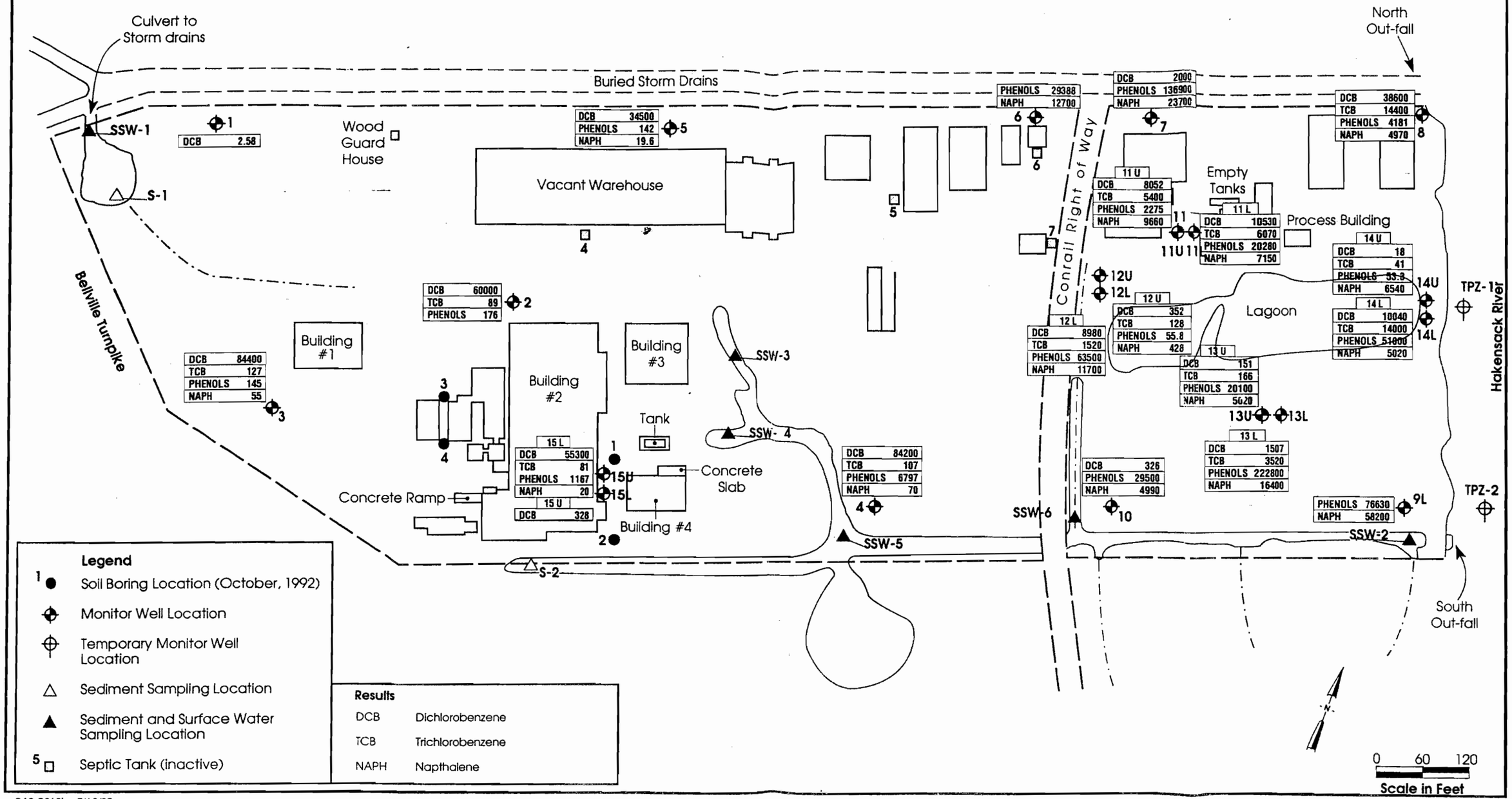
LAB NUMBER SAMPLE NUMBER	HA3948 FB-1		HA3947 FB-2		HA3959 FB-3	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
Metals (mg/L)						
Antimony	**ND**	0.06	**ND**	0.06	**ND**	0.06
Arsenic	**ND**	0.01	**ND**	0.01	**ND**	0.01
Beryllium	**ND**	0.001	**ND**	0.001	**ND**	0.001
Cadmium	**ND**	0.002	**ND**	0.002	**ND**	0.002
Chromium	**ND**	0.01	**ND**	0.01	**BMDL-B**	0.01
Copper	**ND**	0.01	**BMDL-B**	0.01	**ND**	0.01
Lead	**ND**	0.075	**ND**	0.075	**ND**	0.075
Mercury	**ND**	0.0002	**ND**	0.0002	**BMDL-B**	0.0002
Nickel	**ND**	0.02	**ND**	0.02	**ND**	0.02
Selenium	**ND**	0.005	**ND**	0.005	**ND**	0.005
Silver	**ND**	0.01	**ND**	0.01	**ND**	0.01
Thallium	**ND**	0.01	**ND**	0.01	**BMDL-B**	0.01
Zinc	**ND**	0.02	**ND**	0.02	**BMDL-B**	0.02
Chromium, Hexavalent	**ND**	0.01	**ND**	0.01	**ND**	0.01
Cyanide	**ND**	0.1	**ND**	0.025	**ND**	0.025

CONC. – Concentration of Compound
D.L. – Detection Limit
ND – Not detected
BMDL – Present below detection limit, estimated concentration not reported by laboratory
B – Compound also detected in laboratory blanks



846-9813 5/17/93

FIGURE 5-9
VOLATILE ORGANIC COMPOUND CONCENTRATIONS IN GROUNDWATER, (ppb) STANDARD CHLORINE, KEARNY, NJ



846-9813b 5/10/93

FIGURE 5-10
SEMI VOLATILE CONCENTRATIONS IN GROUNDWATER, (ppb)
STANDARD CHLORINE,
KEARNY, NJ

- Phenolics was detected in all the wells east of MW-4L.

Toluene and ethylbenzene were found consistently in wells east of the railroad right-of-way.

TCE and PCE were found in monitor wells 8L, 11L, 11U, 12L, 13L and 14L, located in the old production area, with the highest concentrations in MW-8L. Although these compounds were not found in the water or the sediment in the lagoons, traces were found in soil samples in this area.

BNAs occur in groundwater across the site. Although all organic compounds of concern occur throughout the site, the highest concentrations of dichlorobenzene are found in the western part of the site. The highest concentrations of naphthalene and phenols and phenolics occur in the eastern part of the site. This distribution is consistent with the historic activities that occurred at the site. Elevated levels of naphthalene and phenols detected in MW-6L and MW-7L, although upgradient of the process area and lagoons are located near a storage building for disinfectant byproducts. MW-3L, located between Building No. 1 and the railroad spur contained elevated dichlorobenzenes. Although not near Building 2, MW-3L is located near the spur along which the raw material was transported.

The occurrence of cyanide and chromium in the groundwater throughout the site appears to be related to the chromium slag. The source of lead in groundwater has not been clearly identified. Based on available bulk chemical analysis of the chromium fill, lead is not a major constituent. High levels of lead were reported in coal-related waste material piles on the Koppers site just south of SCCC (Keystone, 1987).

A second round of groundwater sampling was completed on selected monitor wells during Phase II of the RI to confirm previous results. The monitor wells sampled were MW-2,

3, 4, 5, 8, 9, 10, 12L, 14L, and 15L. Two temporary piezometers (TPZ-1 and TPZ-2) that were installed along the Hackensack River at the low tide mark were also sampled. The samples were analyzed for VOCs, BNAs, chromium, and lead. A comparison of the results between the first round and second round (Table 5-12) indicates:

- The VOCs and BNAs were detected at similar levels as during the first round of sampling, with the exception of naphthalene in MW-9L (58,200 µg/L) which was not detected in the second round, and phenol in MW-10L (non-detect) which was detected at 230,000 µg/L in the second round. It should be noted that detection limits were high in these samples because of high dilutions required.

- In most cases, lead was detected at lower levels during the second round of sampling. Total chromium was detected within the same order of magnitude as during the first round. Since the samples were unfiltered, variations in turbidity could affect results, particularly for lead and trivalent chrome.

The results from the temporary piezometers TPZ-1 and TPZ-2 indicate only trace concentrations of VOC or BNA compounds and slightly elevated levels of chromium and lead. Since the piezometers were completed in the riverbank sediments overlying the marsh mat, the concentrations found reflect actual concentrations of contaminants that are discharging to the Hackensack River from the bank. The sand unit is not directly discharging to the river at the bank.

5.5 POTENTIAL RECEPTORS

Chemicals related to past site activities have been identified in groundwater, surface water

TABLE 5-12
SUMMARY OF PHASE II GROUNDWATER ANALYTICAL DATA
VOLATILES, SEMIVOLATILES, AND METALS
SCCC, KEARNY, NJ

LAB NUMBER	CB2194		CB-2184		CB2187		CB2196		CB2195		CB2189		CB2190		CB2188	
SAMPLE NUMBER	MW-2		MW-3		MW-4		MW-5		MW-8		MW-9		MW-10		MW-12	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
VOC Compound (ug/L)																
Methylene chloride	25 JB	50	65 J	100	180 J	250	56 B	50	420 J	500	32 J	50	28	25	46 JB	100
Vinyl chloride	ND	50	ND	100	ND	250	ND	50	350 J	500	ND	50	ND	25	ND	100
1,2-Dichloroethene	ND	50	ND	100	ND	250	ND	50	190 J	500	82 J	250	ND	25	ND	100
Trichloroethylene	ND	50	ND	100	40 J	250	ND	50	5600	500	ND	50	ND	25	52 J	100
Benzene	55	50	56 J	100	250 J	250	23 J	50	430 J	500	85 J	250	160	25	260	100
Tetrachloroethylene	ND	50	ND	100	ND	250	ND	50	2000	500	40 J	50	ND	25	16 J	100
Toluene	6 JB	50	23 J	100	210 J	250	ND	50	ND	500	ND	50	150	25	770	100
Chlorobenzene	380	50	1100	100	300	250	310	50	5200	500	ND	50	140	25	400	100
Ethylbenzene	ND	50	ND	100	52 J	250	ND	50	ND	500	ND	50	73	25	100	100
Carbon disulfide	ND	50	ND	100	ND	250	ND	50	ND	500	ND	50	ND	25	ND	100
Xylene (total)	ND	50	ND	100	95 J	250	ND	50	120 J	500	47 J	250	400	25	600	100
Styrene	ND	50	ND	100	ND	250	ND	50	ND	500	ND	50	ND	25	92 J	100
Acetone	ND	50	ND	100	ND	250	ND	50	ND	500	500	250	310	25	ND	100
BNAs (ug/L)																
Phenol	ND	560	ND	530	150 J	530	31 J	62	2100	670	360000	56000	230000	31000	91000	26000
2-Chlorophenol	58 J	560	ND	530	ND	530	25 J	62	ND	670	ND	5600	ND	620	ND	2600
2-Methylphenol	670	560	ND	530	570	530	ND	62	450 J	670	18000	5600	58000	31000	38000	26000
2,4-Dichlorophenol	180 J	560	120 J	530	ND	530	190	62	ND	670	ND	5600	ND	620	ND	2600
2,4,6-Trichlorophenol	ND	560	ND	530	ND	530	ND	62	ND	670	ND	5600	ND	620	ND	2600
1,3-Dichlorobenzene	9800	2200	7500	2100	8000	2100	3000	620	15000	3300	ND	5600	ND	620	2800	2600
1,4-Dichlorobenzene	14000	2200	11000	2100	11000	2100	4900	620	18000	3300	ND	5600	380 J	620	5400	2600
1,2-Dichlorobenzene	13000	2200	11000	2100	9600	2100	5100	620	16000	3300	ND	5600	640	620	12000	2600
1,2,4-Trichlorobenzene	140 J	560	62 J	530	120 J	530	ND	62	12000	3300	ND	5600	ND	620	5600	2600
Naphthalene	ND	560	ND	530	68 J	530	ND	62	7200	3300	ND	5600	2400	620	19000	2600
Acenaphthalene	ND	560	ND	530	ND	530	ND	62	ND	670	ND	5600	ND	620	ND	2600
Acenapthene	ND	560	ND	530	ND	530	ND	62	ND	670	ND	5600	ND	620	ND	2600
Fluorene	ND	560	ND	530	ND	530	ND	62	ND	670	ND	5600	ND	620	ND	2600
Hexachlorobenzene	ND	560	ND	530	ND	530	ND	62	ND	670	ND	5600	ND	620	ND	2600
Phenathrene	ND	560	ND	530	ND	530	ND	62	ND	670	ND	5600	ND	620	ND	2600
Anthracene	ND	560	ND	530	ND	530	ND	62	ND	670	ND	5600	ND	620	ND	2600
Fluoranthene	ND	560	ND	530	ND	530	ND	62	ND	670	ND	5600	ND	620	ND	2600
Pyrene	ND	560	ND	530	ND	530	ND	62	ND	670	ND	5600	ND	620	ND	2600
bis(2-Ethylhexylphthalate	ND	560	ND	530	ND	530	ND	62	ND	670	ND	5600	ND	620	ND	2600
4-Methylphenol	ND	560	ND	530	710	530	ND	62	1700	670	170000	56000	200000	31000	140000	26000
2,4-Dimethylphenol	ND	560	ND	530	3200	530	ND	62	920	670	6800	5600	31000 J	31000	38000	26000
2-Methylnaphthalene	ND	560	ND	530	ND	530	ND	62	150 J	670	ND	5600	960	620	1500 J	2600
Di-benzofuran	ND	560	ND	530	ND	530	ND	62	ND	670	ND	5600	ND	620	ND	2600
Metals (ug/L)																
Chromium	22.6	10	27.8	10	1210	10	5100	10	1440	10	9560	10	1290	10	118	10
Lead	7.74	1	6.62	1	1.78	1	ND	1	41.6	1	ND	1	3.79	1	8.52	1

CONC. – Concentration of compound
D.L. – Detection Limit
ND – Not detected
NA – Not analyzed
J – Estimated concentration of compound detected below the detection limit
B – Analyte found in laboratory blank sample

TABLE 5-12 (Continued)
SUMMARY OF PHASE II GROUNDWATER ANALYTICAL DATA
VOLATILES, SEMIVOLATILES, AND METALS
SCCC, KEARNY, NJ

LAB NUMBER	CB2185		CB2191		CB2192		CB2718		CB2186		CB2197		CB2200	
SAMPLE NUMBER	MW-14L		MW-14L Dup		MW-15		TPZ-1		TPZ-2		Field Blank		Trip Blank	
	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.	CONC.	D.L.
VOC Compound (ug/L)														
Methylene chloride	27 B	20	16 J	20	190 J	250	3 JB	10	6 J	10	7 J	10	7 J	10
Vinyl chloride	ND	20	ND	20	ND	250	ND	10	ND	10	ND	10	ND	10
1,2-Dichloroethene	ND	20	ND	20	ND	250	ND	10	ND	10	ND	10	ND	10
Trichloroethylene	71	20	75	20	ND	250	2 JB	10	ND	10	ND	10	ND	10
Benzene	140	20	140	20	1700	250	3 J	10	ND	10	ND	10	ND	10
Tetrachloroethylene	24	20	21	20	ND	250	ND	10	ND	10	ND	10	ND	10
Toluene	200	20	210	20	ND	250	ND	10	4 J	10	ND	10	ND	10
Chlorobenzene	48	20	51	20	1200	250	ND	10	ND	10	ND	10	ND	10
Ethylbenzene	55	20	63	20	ND	250	ND	10	ND	10	ND	10	ND	10
Carbon disulfide	25	20	30	20	ND	250	ND	10	ND	10	ND	10	ND	10
Xylene (total)	200	20	250	20	ND	250	ND	10	ND	10	ND	10	ND	10
Styrene	ND	20	ND	20	ND	250	ND	10	ND	10	ND	10	ND	10
Acetone	ND	20	ND	20	ND	250	7 J	10	ND	10	ND	10	ND	10
BNAs (ug/L)														
Phenol	31000	11000	29000	11000	280 J	560	ND	10	ND	13	ND	10	NA	NA
2-Chlorophenol	ND	560	ND	560	58 J	560	ND	10	ND	13	ND	10	NA	NA
2-Methylphenol	14000	11000	14000	11000	ND	560	ND	10	ND	13	ND	10	NA	NA
2,4-Dichlorophenol	ND	560	ND	560	350 J	560	ND	10	ND	13	ND	10	NA	NA
2,4,6-Trichlorophenol	ND	560	ND	560	ND	560	ND	10	ND	13	ND	10	NA	NA
1,3-Dichlorobenzene	1900	560	1400	560	21000	5600	ND	10	ND	13	ND	10	NA	NA
1,4-Dichlorobenzene	2700	560	2100	560	33000	5600	ND	10	ND	13	ND	10	NA	NA
1,2-Dichlorobenzene	2100	560	1600	560	33000	5600	ND	10	ND	13	ND	10	NA	NA
1,2,4-Trichlorobenzene	26000	11000	21000	11000	190 J	560	ND	10	ND	13	ND	10	NA	NA
Naphthalene	6400 J	11000	4700	560	ND	560	6 J	10	3 J	13	ND	10	NA	NA
Acenaphthalene	ND	560	ND	560	ND	560	ND	10	ND	13	ND	10	NA	NA
Acenapthene	180 J	560	140 J	560	ND	560	2 J	10	4 J	13	ND	10	NA	NA
Fluorene	32 J	560	ND	560	ND	560	ND	10	3 J	13	ND	10	NA	NA
Hexachlorobenzene	ND	560	ND	560	ND	560	ND	10	ND	13	ND	10	NA	NA
Phenathrene	ND	560	ND	560	ND	560	ND	10	10 J	13	ND	10	NA	NA
Anthracene	ND	560	ND	560	ND	560	ND	10	ND	13	ND	10	NA	NA
Fluoranthene	ND	560	ND	560	ND	560	2 J	10	6 J	13	ND	10	NA	NA
Pyrene	ND	560	ND	560	ND	560	2 J	10	6 J	13	ND	10	NA	NA
bis(2-Ethylhexylphthalate	ND	560	ND	560	ND	560	8 JB	10	ND	13	ND	10	NA	NA
4-Methylphenol	48000	11000	46000	11000	ND	560	ND	10	ND	13	ND	10	NA	NA
2,4-Dimethylphenol	18000	11000	17000	11000	ND	560	14	10	ND	13	ND	10	NA	NA
2-Methylnaphthalene	770	560	590	560	ND	560	ND	10	ND	13	ND	10	NA	NA
Di-benzofuran	69 J	560	ND	560	ND	560	ND	10	ND	13	ND	10	NA	NA
Metals (ug/L)														
Chromium	272	10	278	10	18.1	10	155	10	35.5	10	ND	10	NA	NA
Lead	21.2	1	ND	1	848	1	61.1	1	13.7	1	ND	1	NA	NA

CONC. - Concentration of compound
D.L. - Detection Limit
ND - Not detected
NA - Not analyzed
J - Estimated concentration of compound detected below the detection limit
B - Analyte found in laboratory blank sample

and sediments. To some extent, contaminants are migrating off site in the following manner:

- Surface water drainage carries dissolved and suspended constituents from all areas of the site directly to the Hackensack River.

- Sediment transport in the surface drainage occurs mainly during high flow periods. Sediment transport from the site has been limited, especially during normal flow periods, by the tidal gates and settling basins.

- Groundwater flows primarily toward the disturbed and backfilled marsh area to the south of the SCCC site. There is a smaller component of groundwater flow directly toward the Hackensack River to the east. Indirectly, shallow groundwater and surface water are hydraulically connected to the Hackensack River.

The major direction of groundwater flow is to the property south of the SCCC site. This area is the Koppers Seaboard site and impacts from similar activities as those on the SCCC site have been documented. The Koppers site has been extensively investigated and contaminants similar to those found on the SCCC site have been documented, particularly naphthalene, chromium, and lead.

It was not practical in the remedial investigation to directly measure the impact from the site to the off-site areas. The Hackensack River is a major navigable waterway with strong currents and tides. The boundary between the shoreline and the river is abrupt. Mixing and dilution of site discharge occurs rapidly with no transition zone. The general area along the Hackensack is highly industrialized and SCCC is one of many potential source areas. However, a calculated estimate of contaminant amounts that could be contributed by the site is presented in the following section.

5.6 ESTIMATES OF FLOW VOLUMES AND CONTAMINANT LOADING

Given the difficulty of directly measuring off-site impacts, some estimates of the volume of surface water and groundwater from the SCCC site can give some perspective on the level of off-site impact. To this purpose, estimates of surface water and groundwater flow have been made and are presented in the following paragraphs. These estimates are intended only to give a feel for the magnitude of the problem, and possibly suggest additional areas of analysis in the Feasibility Study.

5.6.1 Surface Water Volume Estimates

Prior to entering the Hackensack River, the surface runoff from the site mixes with groundwater discharge, runoff from the Koppers site to the south ditch and runoff from the Belleville Turnpike in the north storm drain. Assuming 70 percent of the average 44 in. of annual precipitation falling on the site ends up as runoff, the 22-acre area contributes approximately 56 acre ft or 2.5 million ft^3 per year, or less than 6,800 ft^3 per day. Assuming a loading of organic constituents of 2.0 mg/kg, approximately 0.4 kg/day would be transported in surface water.

5.6.2 Groundwater

A rough estimate of groundwater flow was made using the results of the slug tests and the water table map (Figure 5-8) applying Darcies law to calculate the volume of flow through a cross section of porous medium, Q = KiA, where Q is the flow volume, K is hydraulic conductivity, i is the gradient of flow, and A is the cross-sectional area. For the purpose of this calculation, four cross-sectional areas were considered parallel to discharge areas along the southern and eastern site boundaries. Using the gradient measures from Figure 5-8 in each area, plus average K values based on wells, the prospective area volume estimates of discharge from the site to the Hackensack River and to the south were estimated. It should be noted that the actual area of discharge in either

direction is not known. Based on the site cross sections (Figure 5-5) and the piezometer test results, groundwater does not discharge directly at the river bank, nor does the flow to the south primarily go directly into the drainage ditch.

The results of the flow calculations are presented in Table 5-13. Total flow is estimated to be approximately 524 ft^3/day, of which an estimated 16 percent is directed toward the river. Assuming a loading of 100 mg/L of organics in groundwater, total site discharge would be approximately 1.5 kg/day, with 0.23 kg/day directly toward the Hackensack. These values represent groundwater quality at the site boundary and the actual concentrations and loading at the discharge area would be affected by chemical mobility, distance to the discharge area, and changes in sediment permeabilities. Retardation of most of the chemicals of concern is high and as noted earlier, most of the groundwater does not discharge immediately to surface water near the site boundary.

Table 5-13

Estimate of Boundary Flow Off-Site
SCCC, Kearny, NJ

Groundwater Discharge Front, L	Slug Tested Wells	K (Avg.) (ft/day)	L (in feet)	Gradient i	A (Lx15)	Q=KiA (ft^3/day)
Hackensack River between MW-14 and NEC (MW-8)	14L 8L	2.8	275	0.0033	4,125	38.1
Hackensack River between MW-14 and SEC (MW-9)	14L 9L 13L	5.3	275	0.0020 (E-W component)	4,125	43.8
E-W Drainage between MW-4 and SEC (MW-9)	4L 9L 13L	8.4	725	0.003	10,875	274.1
E-W Drainage west of MW-4	All Tests	5.34	750	0.0028	11,250	168.2
Total Estimated Boundary Flow						524.2

NEC = Northeastern corner
SEC = Southeastern corner
E-W = East-West

SECTION 6
CONCLUSIONS AND RECOMMENDATIONS

As a result of past activities at the SCCC site, releases to soils and groundwater have occurred involving several groups of chemical constituents.

- Polynucleatic aromatic hydrocarbons (PAHs), including naphthalene, fluoranthene, and pyrene.

- Phenols.

- Metals, particularly chromium and lead. (Associated with the use of chromium waste and other waste as structural fill over most of the site.)

- Chlorinated phenols.

- Chlorobenzenes (mono, di, and tri).

- Volatile hydrocarbons, benzene, toluene (BTE), ethylbenzene, and xylene (BTEX).

- PCBs (found in concentrations of concern only on the transformer pad, septic tank solids, and in waste drums). As discussed in Subsection 5.1, there is a question on the positive identification of PCBs.

- Chlorinated solvents, TCE, PCE, and their breakdown products. (Limited to the northeast corner of the site and not related to any of the documented site activities.)

A list of chemicals of concern is presented in Table 6-1. This list includes constituents found in waste, soils, sediments, groundwater, and surface water during the RI, except for 2,3,7,8-TCDD which was delineated in a previous investigation. Most of the constituents were found in on-site soils and groundwater. The corresponding NJDEPE action level for non-residential soils and Class II A groundwater is presented for each constituent. Although the sand underlying the site is not a source of potable water, Class IIA may apply because the groundwater discharges to surface water. This is for comparison only, since the actual site remedial action levels will be developed in the Feasibility Study.

6.1 SOURCE AREAS

There were three potential source areas identified and characterized during the RI: waste lagoons, aboveground product storage tanks, and septic tanks. As a result of this characterizations, the following conclusions are made.

6.1.1 Chromium Fill

The chromium fill covers most of the site and extends in places into the water table. Test pit samples indicate that chromium extends into underlying soils at the base of the chromium fill. The capping of the site has eliminated exposure to the waste to surface runoff and wind but portions in the groundwater table can still potentially leach hexavalent chrome to shallow groundwater. Because much of the waste is in the ditches and along the banks, capping has probably not changed surface water quality. Since the chromium waste covers most of the site, any action to address organics in soils will need to consider the implication of chromium present in high concentrations.

6.1.2 Waste Lagoons

The waste lagoons are two contiguous bodies containing a combined estimated volume of 7,400 yd^3 (198,000 ft^3) of material. Although two physically distinct layers were found

Table 6-1

Contaminants of Concern and NJDEPE Guidelines

Contaminant	Non-Residential Surface Soil (mg/kg)	Class IIA Groundwater (mg/L)
VOCs		
Methylene chloride	170	0.03
Vinyl chloride	7	0.002
1,2-trans-Dichloroethene	10,000	0.1
Trichloroethene (TCE)	100	0.001
Benzene	13	0.001
Toluene	1,000	1.0
Ethylbenzene	1,000	0.7
Xylene	6,300	0.04
Tetrachloroethene (PCE)	37	0.001
BNAs		
Phenol	10,000	4.0
2-Chlorophenol	5,000	0.04
2,4-Dimethylphenol	5,200	0.1
2,4-Dichlorophenol	5,200	0.02
2,4,6-Trichlorophenol	260	0.02
1,2-Dichlorobenzene	10,000	0.6
1,3-Dichlorobenzene	10,000	0.6
1,4-Dichlorobenzene	1,200	0.07
1,2,4-Trichlorobenzene	10,000	0.009
Naphthalene	4,200	0.03
Acenaphtene	10,000	0.4
Anthracene	10,000	2.0

Table 6-1 (Continued)

Contaminants of Concern and NJDEPE Guidelines

Contaminant	Non-Residential Surface Soil (mg/kg)	Class IIA Groundwater (mg/L)
Benzo(a)anthracene	2.5	0.01
Benzo(b)fluoranthene	2.5	0.01
Fluoranthene	10,000	0.3
Fluorene	10,000	0.3
Hexachlorobenzene	2	0.01
Pyrene	10,000	0.2
bis-(2-Ethylhexyl)phthalate	210	0.03
Benzo(a)pyrene	0.66	0.02
Benzo(g,h,i)perylene	2.5	--
Chrysene	2.5	0.02
Di-benzo(a,h)anthracene	0.66	0.02
Di-n-butylphthalate	10,000	0.9
Indeno(1,2,3 cd)pyrene	2.5	0.02
Metals		
Antimony	340	0.02
Arsenic	20	0.008
Beryllium	2	0.02
Cadmium	100	0.004
Chromium	--	0.1
Copper	600	--
Lead	600	0.01
Mercury	260	0.002

Table 6-1 (Continued)

Contaminants of Concern and NJDEPE Guidelines

Contaminant	Non-Residential Surface Soil (mg/kg)	Class IIA Groundwater (mg/L)
Nickel	2,400	0.1
Selenium	1,000	0.05
Silver	2,000	0.02
Thallium	2	0.01
Zinc	1,500	5.0
Cyanide	5,200	0.2

(a dark tar-like lower layer overlain by lighter colored material with bladed crystals), naphthalene was the most abundant constituent in all four samples of lagoon material. Other PAH compounds and phenols were the next abundant. Dichlorobenzenes and benzene were detected as a minor component of only one sample. Ethylbenzene and toluene were also present as minor components.

The bulk chemistry of the waste lagoons is therefore more reflective of the naphthalene production operation by Koppers before 1962. Although the lagoons contain two visually distinct layers, the layers' chemistry is similar. Dichlorobenzenes appear to be a minor component of the upper layer of the waste. This characterization is consistent with the reported disposal of relatively small amounts of chlorobenzene waste between 1970 and 1979.

The waste lagoons are unlined and the base of the waste is below the elevation of the shallow groundwater table. The lagoon waste is likely the principal source of releases of naphthalene, other PAHs, and phenols to groundwater in the eastern part of the site. Dioxin compound 2,3,7,8-TCDD was found in lagoon waste samples throughout the vertical and horizontal extent of the waste material. 2,3,7,8-TCDD was not found in surface water in the lagoon or in monitor wells adjacent to the lagoon.

6.1.3 Aboveground Product Storage Tanks

Product storage tanks and product handling areas were historically located around the old naphthalene process area north of the lagoons and adjacent to Buildings 2 and 4. The only remaining storage tanks contained trichlorobenzene and were cleaned out in 1991. Therefore, as a potential primary source, these tanks are no longer an issue.

6.1.4 Septic Tanks

Levels of organic compounds in water and solids from four out-of-service septic tanks

were at concentrations similar to nearby groundwater. Therefore, while the tank contents contain site chemicals of concern, they are not a "hot spot" source area. SCCC is currently planning to clean out and formally close the tanks.

6.2 SECONDARY SOURCE AREAS

Contaminated soils represent a potential source of constituents to groundwater and surface water. Elevated levels of organic compounds were found in the old aboveground storage areas in the process area north of the lagoons and around Building 2 storage and handling areas.

Although chlorinated benzenes are not a major constituent of the lagoon waste, dichlorobenzenes and trichlorobenzenes were found in surface soils in equal or greater abundance than the PAHs. High concentrations in soils are a potential continuing source of constituents to the shallow groundwater in the area. However, based on the groundwater analyses and the analysis of soil boring samples below the water table near Building 2, the greater mass of chemicals is probably already in the saturated zone.

6.3 PATHWAYS

Two principal pathways of contaminant migration were identified and investigated during the RI: surface drainage and shallow groundwater. The sampling completed during the RI confirm that groundwater, surface water, and sediments have been impacted by chemicals related to past site activities. Surface drainage from the site is directed to a drainage gully connected through culverts to the Hackensack River. Groundwater flow is directed primarily to the south (Koppers property), with a minor component toward the Hackensack River.

6.3.1 Surface Drainage

Levels of volatile and semivolatile constituents in the part-per-million concentration range were found in surface drainage water. Although elevated levels were also found in drainage ditch sediments, sediment transport to the Hackensack is limited by drainage depressions and tide gates which restrict flow velocities. Therefore, the major migration mechanism is constituents dissolved or suspended in surface water.

6.3.2 Groundwater

Levels of volatile and semivolatile constituents in groundwater are typically above 100 mg/L near the lagoons and other source areas. Free phase product was observed in one monitor well (15L) and soil boring (SB-2) between Buildings 2 and 4. While most of the distribution is consistent with known historical activities, there are several anomalies: chlorinated solvents, including TCE, PCE, and their byproducts, were found in elevated concentration in the northeast corner of the site (MW-8L) and in lesser concentrations in MW-11 U/L in the process area. Although MW-8L is downgradient from the process area and contains site-related BNA compounds, no potential source of solvents is known.

Groundwater flows from the site to the south (Koppers property) and to a lesser extent to the Hackensack River. Based on the hydrologic site information, approximately 16 percent of the total site groundwater was calculated to flow toward the river. Site cross sections and piezometers along the river bank indicate that most of the groundwater does not directly discharge to the drainage ditch or the river bank but appears to continue beneath these boundaries to a broader area of discharge.

The presence of a thick, dense regionally extensive clay stratum restricts vertical groundwater flow. Based on available information, groundwater in the underlying Brunswick Formation is not potable.

6.3.3 Distribution of Dioxin

The presence of 2,3,7,8-TCDD appears limited to the lagoon waste and limited surface soils adjacent to the lagoons. It was not found in monitor wells around the lagoon. Also, although the recent wipe sampling of the distillation building was inconclusive (due to sample interference), historical association with the naphthalene manufacturing and past sampling indicate that portions of the building surfaces are contaminated with 2,3,7,8-TCDD. Although 2,3,7,8-TCDD is not migrating off site, its presence will need to be considered in the Feasibility Study of remedial alternatives.

6.4 ADDITIONAL DATA NEEDS

Before proceeding with the Feasibility Study, it is recommended that groundwater physical and chemical data currently being collected by others on the Maxus and Koppers sites be reviewed and integrated with the site groundwater data. Evaluation of groundwater alternatives should be based on an area perspective since contaminant sources and releases to groundwater are known to have occurred at the Koppers site and may also have occurred on the Maxus site.

A resolution should be reached regarding the possibility of false positives for PCB detection. Since only waste samples and a transformer pad sample are in question, this will not have any effect on the bulk of the FS. However, the issue should be resolved and resampling done, if necessary.

SECTION 7
REFERENCES

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APPENDIX A

WELL RECORDS

E 26-13-753

FORM 87

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 26-4099
Application No. _____
County Hudson

WELL RECORD

1. OWNER Schiavone Const Co ADDRESS Belleville Pike
   Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION Belleville Pike Kearny N.J.
3. DATE COMPLETED May 19 DRILLER Algeier Bros
4. DIAMETER: top 6 inches Bottom 6 inches TOTAL DEPTH 215 Feet
5. CASING: Type BK Threaded Diameter 6 inches Length 105 Feet
6. SCREEN: Type _____ Size of Opening ___ Diameter _____ inches Length _____ Feet
   Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____
   Tail piece: Diameter _____ inches Length _____ Feet
7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date May 19 Yield 6 Gallons per minute
   Static water level before pumping 23 Feet below surface
   Pumping level 180 feet below surface after 4 hours pumping
   Drawdown 157 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown
   How Pumped Submersible How measured _____
   Observed effect on nearby wells _____
9. PERMANENT PUMPING EQUIPMENT:
   Type Submersible Mfrs. Name Fairbanks Morse
   Capacity 6 G.P.M. How Driven Elect H.P. ½ R.P.M. 3450
   Depth of Pump in well 189 Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well ___ Feet Type of Meter on Pump _____ Size ___ Inches
10. USED FOR Toilet + Washing Only AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
11. QUALITY OF WATER Brackish. Sample: Yes ___ No. ___
    Taste _____ Odor _____ Color _____ Temp. _____ °F
12. LOG _____ Are samples available? _____
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
13. SOURCE OF DATA _____
14. DATA OBTAINED BY Conrad Algeier Date Oct-30-67

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

2 - Orig. & 1 cy

26-13-7751

Form 87-10a

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 26-1783
Application No. _____
County _____

WELL RECORD

OWNER NEWARK PARAFFINE CO ADDRESS 70 BLANCHARD ST

Owner's Well No. # 1 SURFACE ELEVATION 10 (Above mean sea level) Feet

LOCATION 70 BLANCHARD, NEWARK

DATE COMPLETED APRIL 10, 1958 DRILLER P. CHAFITELLI

DIAMETER: top 7 Inches Botton 8 Inches TOTAL DEPTH 503 Feet

CASING: Type BLACK STAN. Diameter 7 Inches Length 70 Feet

SCREEN: Type — Size of Opening — Diameter — Inches Length — Feet

Range { Top — Feet Bottom — Feet Geologic Formation T.R.B

Tail piece. Diameter — Inches Length — Feet

W[illegible] LOWS NATURALLY — Gallons per Minute at — Feet above surface

Water rises to — Feet above surface

RECORD OF TEST: Date APRIL 10, 58 Yield 100 GPM Gallons per minute

Static water level before pumping 26' Feet below surface

Pumping level 160' feet below surface after 3 hours pumping

Drawdown 134' Feet Specific Capacity — Gals. per min. per ft. of drawdown

How Pumped SUBMERSIBLE How measured AIR LINE

Observed effect on nearby wells NONE

PERMANENT PUMPING EQUIPMENT:

Type SUBMERSIBLE Mfrs. Name MEYERS

Capacity 150 G.P.M. How Driven MOTOR H.P. 15 R.P.M. —

Depth of Pump in well 200 Feet — Depth of Footpiece in well — Feet

Depth of Air Line in well — Feet — Depth of Meter on Pump —

USED FOR INDUSTRIAL AMOUNT Average 800 Gallons Daily

Maximum 800 Gallons Daily

QUALITY OF WATER [illegible] Sample: Yes — No —

Taste OK Odor NONE Color CLEAR Temp. — °F

LOG 0-65 CLAY & STONES 65-503 SHALE Are samples available NO

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

SOURCE OF DATA —

DATA OBTAINED BY P. CHAFITELLI Date APRIL 15-1958

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

outside

26.13.775

FORM 87

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 26-1940
Application No. _____
County Essex

WELL RECORD

1. OWNER Eureka Construction Co. ADDRESS 171 Bleecker St.
Owner's Well No. one SURFACE ELEVATION 10 Feet Feet
(Above mean sea level)

2. LOCATION Newark, Essex Co., N.J.

3. DATE COMPLETED Jan. 23, 1959 DRILLER Andy Stevenson

4. DIAMETER: top 8 Inches Bottom 6 Inches TOTAL DEPTH 500 Feet

5. CASING: Type Steel Diameter 8 inches Length 90 Feet

6. SCREEN: Type _____ Size of Opening ___ Diameter _____ Inches Length _____ Feet

Range in Depth { Top _____ Feet / Bottom _____ Feet Geologic Formation _____

Tail piece: Diameter _____ Inches Length _____ Feet

WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface

Water rises to _____ Feet above surface

8. RECORD OF TEST: Date Jan. 23, 1959 Yield 75 Gallons per minute

Static water level before pumping 25 Feet below surface

Pumping level 250 feet below surface after 12 hours pumping

Drawdown 225 Feet Specific Capacity _____ Gals. per min. per ft. of drawdown

How Pumped Turbine How measured Orifice

Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT:

Type Turbine Mfrs. Name Deming

Capacity 75 G.P.M. How Driven electric H.P. 15 R.P.M. 1750

Depth of Pump in well 300 Feet Depth of Footpiece in well 30 Feet

Depth of Air Line in well no Feet Type of Meter on Pump no Size ___ Inches

10. USED FOR Cooling AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily

11. QUALITY OF WATER _____ Sample: Yes X No. ____

Taste no Odor no Color clear Temp. 54 °F

12. LOG clay, sand red rock and shale Are samples available? no
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

SOURCE OF DATA Ainbrand Well Drilling Co. Inc.

14. DATA OBTAINED BY Adam F. Ainbrand Date Feb. 10, 1959

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

P55

FORM 87

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 26-3293
Application No. _____
County _____

WELL RECORD

1. OWNER Fairmount Chemical Co., Inc. ADDRESS 117 Blanchard St., Newark, N.J.
   Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)
2. LOCATION 117 Blanchard St., Newark, Essex County
3. DATE COMPLETED Industrial DRILLER Somerville Well Drilling Co.
4. DIAMETER: top ~~8~~ Inches Bottom 8 Inches TOTAL DEPTH 300 Feet
5. CASING: Type LDrive Diameter 8 Inches Length 114 Feet
6. SCREEN: Type _____ Size of Opening ___ Diameter _____ Inches Length _____ Feet
   Range in Depth { Top _____ Feet / Bottom _____ Feet } Geologic Formation _____
   Tail piece: Diameter _____ Inches Length _____ Feet
   WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
   Water rises to _____ Feet above surface
8. RECORD OF TEST: Date 8/5/65 Yield 300 Gallons per minute
   Static water level before pumping 50 Feet below surface
   Pumping level 200 feet below surface after 8 hours pumping
   Drawdown 150 Feet Specific Capacity 2 Gals. per min. per ft. of drawdown
   How Pumped air How measured weir
   Observed effect on nearby wells none
9. PERMANENT PUMPING EQUIPMENT:
   Type _____ Mfrs. Name _____
   Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
   Depth of Pump in well _____ Feet Depth of Footpiece in well _____ Feet
   Depth of Air Line in well ____ Feet Type of Meter on Pump _____ Size ___ Inches
10. USED FOR Industrial AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily }
    [illegible] 1,200 ppm Cl⁻ on 8/5/65 [illegible]
11. QUALITY OF WATER _____ Sample: Yes ___ No. x
    Taste slightly salty? Odor none red shale, red Color clear Temp. [illegible] 50 °F
12. LOG 0 - 55' overburden, 55'-300' sandstone Are samples available? no
    (Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)
    SOURCE OF DATA Somerville Well Drilling Co.
14. DATA OBTAINED BY Same Date 8/9/65

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

outside.

26·13·775 ☐

Form 87

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF WATER POLICY & SUPPLY

Permit No. 26-4136
Application No. _____
County _____

WELL RECORD

1. OWNER Fairmount Chemical Co. ADDRESS 117 Blanchard Street, Newark, N.J.
Owner's Well No. _____ SURFACE ELEVATION _____ Feet (Above mean sea level)

2. LOCATION Newark, Essex County

3. DATE COMPLETED 9/18/68 DRILLER Somerville Well Drilling Co.

4. DIAMETER: top 12 Inches Bottom 8 Inches TOTAL DEPTH 250 Feet

5. CASING: Type ~~Drive~~ Diameter 8" Inches Length 74 Feet

6. SCREEN: Type _____ Size of Opening ___ Diameter _____ Inches Length _____ Feet
Range in Depth { Top _____ Feet / Bottom _____ Feet Geologic Formation _____
Tail piece: Diameter _____ Inches Length _____ Feet

7. WELL FLOWS NATURALLY _____ Gallons per Minute at _____ Feet above surface
Water rises to _____ Feet above surface

8. RECORD OF TEST: Date 9/18/67 Yield 200 Gallons per minute
Static water level before pumping 70 Feet below surface
Pumping level 210 feet below surface after _____ hours pumping
Drawdown 140 Feet Specific Capacity 2 Gals. per min. per ft. of drawdown
How Pumped air test How measured _____
Observed effect on nearby wells none

9. PERMANENT PUMPING EQUIPMENT:
Type _____ Mfrs. Name _____
Capacity _____ G.P.M. How Driven _____ H.P. _____ R.P.M. _____
Depth of Pum. in well _____ Feet Depth of Footpiece in well _____ Feet
Depth of Air Line in well _____ Feet Type of Meter on Pump _____ Size ___ Inches

10. USED FOR cooling AMOUNT { Average _____ Gallons Daily / Maximum _____ Gallons Daily

11. QUALITY OF WATER good Sample: Yes ___ No. xx
Taste none Odor none Color clear Temp. _____ °F

12. LOG argillite Are samples available? no
(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy)

13. SOURCE OF DATA Somerville Well Drilling Co.

14. DATA OBTAINED BY Same Date 3/8/68

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements etc.)

outside breaks?

26·13·775

WR- 138

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

PERMIT NO. 26-49141

APPLICATION NO. _____

COUNTY Union I.C.

SEALED

WELL RECORD

1. OWNER Newark Box Board Company ADDRESS 17 Blanchard Street

Owner's Well No. One SURFACE ELEVATION 25 Feet (Above mean sea level)

2. LOCATION Newark Essex Co N.J.

3. DATE COMPLETED Dec 1 1981 DRILLER Kinbrand Well Drilling Co Inc

4. DIAMETER: Top 10 inches Bottom 10 inches TOTAL DEPTH 400 Feet

5. CASING: Type Steel Diameter 10 Inches Length 90 Feet

6. SCREEN: Type N Size of Opening ___ Diameter ___ Inches Length ___ Feet

Range in Depth { Top ___ Feet / Bottom ___ Feet Geologic Formation ___

Tail Piece: Diameter ___ Inches Length ___ Feet

7. WELL FLOWS NATURALLY no Gallons per minute at ___ Feet above surface

Water rises to ___ Feet above surface

8. RD OF TEST: Date Nov 3 1981 Yield 105 Gallons per minute

Static water level before pumping 21 Feet below surface

Pumping level 200 feet below surface after 8 hours pumping

Drawdown 179 Feet Specific Capacity ___ Gals. per min. per ft. of drawdown

How pumped Turbine How measured Orifice

Observed effect on nearby wells None

PERMANENT PUMPING EQUIPMENT:

Type ___ Mfrs. Name Comm. to supply

Capacity ___ G.P.M. How Driven ___ H.P. ___ R.P.M. ___

Depth of Pump in well ___ Feet Depth of Footpiece in well ___ Feet

Depth of Air Line in well ___ Feet Type of Meter on Pump ___ Size ___ Inches

USED FOR Industrial AMOUNT { Average ___ Gallons Daily / Maximum ___ Gallons Daily

12-installed a liner 140 ft with rubber packer

QUALITY OF WATER ___ Sample: Yes X No ___

Taste Salty Odor No Color Clear Temp. 56 °F.

LOG 72 silt clay 328 red shale sand stone Are samples available? no

(Give details on back of sheet or on separate sheet. If electric log was made, please furnish copy.)

SOURCE OF DATA Kinbrand Well Drilling Co Inc

OBTAINED BY Adam J Pavlovich Date Dec 10 1981

(NOTE: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

Just inside

26-13.778

5M-8-51

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
Division of Water Policy & Supply
WELL RECORD

Permit No. 26-429
Application No. _____
County _____

NER ARDEN CHEMICAL Co. ADDRESS 60 BLANCHARD ST. NEWK, N.J.
mer's Well No. NO. #1 SURFACE ELEVATION _____ Feet (Above mean sea level)
CATION ABOVE
TE COMPLETED 3-18-52 DRILLER S. D'ALESSIO GARDEN STATE ART. WELL & PUMP CO.
AMETER: Top 8 Inches Bottom 8 Inches TOTAL DEPTH 400 Feet
SING: Type DRIVE-PIPE Diameter 8 Inches Length 90 Feet
CREEN: Type NONE Size of Opening _____ Diameter _____ Inches Length _____ Feet
ange in Depth { Top _____ Feet Geologic Formation _____ Bottom _____ Feet
ail piece. Diameter _____ Inches Length _____ Feet
E[illegible]FLOWS NATURALLY — Gallons per Minute at — Feet above surface
[illegible]ses to — Feet above surface
RECORD OF TEST: Date MARCH 19, 1952 Yield 90 Gallons per minute
Static water level before pumping 21 Feet below surface
Pumping level 120 feet below surface after 8 hours pumping
Drawdown 99 Feet Specific Capacity 1.1 Gals. per min. per ft. of drawdown
How Pumped DEEP WELL TURBINE How measured AIR LINE & GAUGE
Observed effect on nearby wells NO OBSERVATIONS MADE
PERMANENT PUMPING EQUIPMENT: NONE
Type _____ Capacity _____ Gallons per minute
How Driven _____ Horse Power _____ R.P.M. _____
Depth of pump in well _____ Feet Depth of Foot piece in well _____ Feet
Depth of Air Line in well _____ Feet Type of Meter on Pump _____
USED FOR INDUSTRIAL AMOUNT { Average _____ Gallons Daily; Maximum _____ Gallons Daily
QUALITY OF WATER GOOD Sample: Yes _____ No. ✓
Taste NO Odor NO Color CLEAR Temperature ? °F
LOG CLAY MATRIX - SOFT SHALE - RED SHALE (Give details on back of sheet or on separate sheet) Are samples available? YES
SOURCE OF DATA BAIL
[illegible] OBTAINED BY DRILLER DATE 3/18/52

Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

26-13-841 (meadow part

The White Tar Company

OF NEW JERSEY, INC.

MANUFACTURERS OF

"WHITE TAR PRODUCTS"

NEW YORK OFFICE, 103 JOHN ST., NEW YORK CITY

FACTORY, KEARNEY, NEW JERSEY.

BYRD WALKER, PRESIDENT.
LON. S. LANDERS, VICE PRES'T.
J. J. SCHEUCH, SEC'Y AND TREAS.
H. O. BOSWORTH, MANAGER.

PHONE 261 ARLINGTON
POST OFFICE ADDRESS FIVE CORNERS STATION JERSEY CITY.
CABLE ADDRESS "TARWHITE" A B C. CODE 4TH & 5TH EDITIONS USED

KEARNEY, N.J. Apr. 18, 1917

RECEIVED

APR [illegible]

The State Geologist.

Trenton, N. J.

Dear Sir,

We have recently erected a plant in Kerney, N. J. for the manufacture of creosote disinfectants and for refining napthalene. We are located on the west bank of the Hackensack River, right near the Pennsylvania high speed line running to the main station in New York, and just a little below and on the other side of the river from Snake Hill. We are located upon meadow land.

For our water supply we sank an eight inch well to a depth of about three hundred feet. This well is cased to a depth of about seventy-three feet where the casing is driven into bed rock. The well borer assures us that we have a tight joint at bed rock, and that his hole was practically dry after reaching bed rock until he has obtained a depth of about one hundred twenty-five feet. The well goes through red shale.

The water which we have obtained is anything but satisfactory and very hard. Strange as it may seem the well water was tested in January when we were using it pumping it with a small hand pump. This gave a result showing quite hard water, but still usable. On the basis of this analysis we arranged for

26-13,841

a water softener. Upon the installation of this machine as further samples of water were taken and the analysis showed a very much increased hardness. At the later date we were pumping with our mechanical equipment. The water was so much harder than the original sample taken that the water softener does not work and the company have thrown up their hands on the proposition.

For boiler purposes we could probably get along by using a compound but for our disinfectant work and for one step in our napthalene refining we should have water which does not give a precipitate. We make up caustic solutions and at present there is very heavy flocculent white precipitate. This precipitate certainly must be avoided in the manufacture of disinfectants.

The water tests high in percentage of chloride, in fact this increased percentage is one of the main differences compared with the sample taken last January. It looks very much as if there was an inflow of sea water into the well. If the seal and bed rock is as good as we are assured, this inflow must get in below that point.

In the light of your knowledge and experience would there be any advantageeus in our attempting to seal off the water, say above the two hundred foot level or at such a point as you could suggest, and taking our water from below that point. Do you know of this having been done successfully in our neighborhood or some other locality where a like trouble was experienced. If there is much likelihood of this resulting in better water we would not hesitate to make the experiment.

We will add further that there is another artisian well on our neighbor's property, the Martin Dennis Co., about five

26-13841

hundred feet from our well, and sunk to the same depth, Their experience in regards to the water getting harder is about the same as ours , although at the present time their water is not as hard as ours. This latter may be due to the fact that they use a much larger volume of water than we do.

We will certainly appreciate any advice that you, no doubt, can give us, and thanking you in advance for your courtesy,

We are,

Yours very truly,

WHITE TAR CO. OF N. J. INC.

H O Brownell

Manager.

HOB/AH.

26.1384

April 19, 1917.

The White Tar Company,
Mr. H. O. Bosworth, Manager,
Kearney, N. J.

Dear Sir:-

...Your letter of April 18 in reference to water-supply at your Kearney plant has been received. The conditions which you mention have not been duplicated in any well in New Jersey which has been brought to my attention, therefore I am not able to advise you in the light of previous experience. It is, however, not unusual to find water with high mineral content in the red shale formation, but since you do not give me the analyses of your water, I do not know whether its composition is the same, or different from these other wells. Many years ago a deep well was drilled at Paterson in the red shale, and while fresh water was found at 900 feet in limited amounts, brackish water was found at depths of 1500 to 1800 feet and it was necessary to case off the bottom of the well.

There are several hypotheses which may be advanced to account for the facts as you state them. It is possible that there is an infiltration of brackish water where the casing is driven into the bed rock. Against this you have the testimony of your driller that he made a tight joint at this point. There is a possibility that since thegeneral dip of the beds is westward, brackish water enters the rock at some point east of your well and is carried downward toward your well through the cracks and crevices which trend in that direction, and that with pumping you are drawing into your well this seepage water from the river. There is a third possibility - that in your pumping you are making drafts upon the ground water which has been in storage in the rock for an extremely long time, and has so become highly charged with mineral matter, whereas when you first commenced to pump you were using water which had reached its position more recently. In the latter event, it is conceivable that ultimately this ancient water might be exhausted.

If I knew more about the detailed succession of beds which overlie bed rock in your vicinity, I might draw some inferences as to the probability that brackish surface waters are seeping through. It might readily happen if the 73 feet of material overlying the rock was largely gravel or sand. If, on the other hand, there were thick beds of tough clay, the probability would be much decreased.

Yours truly,

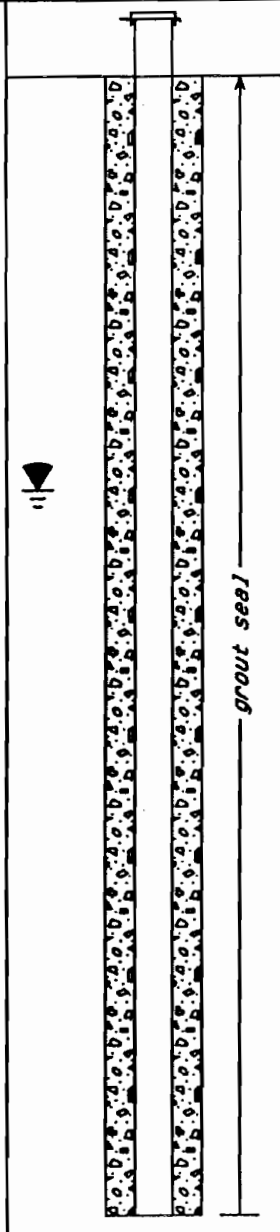
APPENDIX B

DRILLING AND WELL COMPLETION LOGS

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

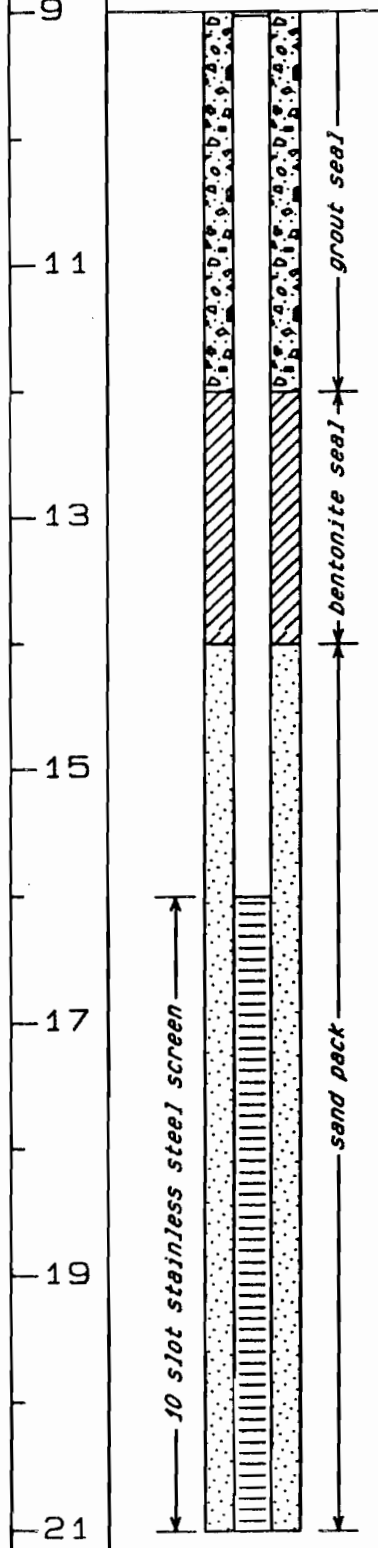
Well Number MW-1L
Coordinates E602518.73, N698067.65
Top of Casing Elevation 8.54 feet
Groundsurface Elevation 6.18 feet
Total Borehole Depth 21 feet
Total Well Depth 21 feet
Date Started 11/30/90
Date Well Completed 11/30/90



	DESCRIPTION
0-2'	0-.3' silt (5YR3/4) dry, soft. .3-.6' Black asphalt type material, sand size with gravel chunks. .6-1.5' silty sand (5R3/4) fine grained, mottled, dry, some black mottling.
2-4'	Water at 3.5' Sand, (5YR3/2) brown-gray, fine to medium, some pebbles.
4-6'	Sand and gravel, brown-gray, green pockets of chrome fill.
6-8'	Same - green coated sandy grains.
8-10'	Same.

OVERBURDEN WELL

PROJECT STANDARD CHLORINE WELL NUMBER MW-1L



DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
9						
			50			10-12' 10-10.3' caving, silt, grass roots. 10.3-10.5' black sand. 10.5-12' marsh mat, organic layer, sulfur smell.
11			100			
						12-14' 12-13.2' meadow mat. 13.2-13.75' fine grained sand, (10YR4/2) brown-gray, 20-30% clay, fairly plastic.
13			88			
						14-16' 14-14.5' caving. 14.5-16' sand, (5YR2/2) dark brown-gray 14.5-15' clayey sand, 20% clay. 15-16' grades to medium to coarse sand, well sorted, subrounded grains.
15			100			
						16-18' Sand as above, at 16.7-17' thick lense clayey sand.
17			100			
						18-20' Beach sand as above; bottom 6" gray clay, dry, stiff, silty.
19			100			
						20-21' Sand, not representative due to running sands.
21						

OVERBURDEN WELL

PROJECT STANDARD CHLORINE WELL NUMBER MW-1L

DEPTH IN FEET	WELL CONSTRUCTION DETAIL	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
9				50			
							10-12' 10-10.3' caving, silt, grass roots. 10.3-10.5' black sand. 10.5-12' marsh mat, organic layer, sulfur smell.
11				100			
							12-14' 12-13.2' meadow mat. 13.2-13.75' fine grained sand, (10YR4/2) brown-gray, 20-30% clay, fairly plastic.
13				88			
							14-16' 14-14.5' caving. 14.5-16' sand, (5YR2/2) dark brown-gray 14.5-15' clayey sand, 20% clay. 15-16' grades to medium to coarse sand, well sorted, subrounded grains.
15				100			
							16-18' Sand as above, at 16.7-17' thick lense clayey sand.
17				100			
							18-20' Beach sand as above; bottom 6" gray clay, dry, stiff, silty.
19				100			
							20-21' Sand, not representative due to running sands.
21							

grout seal

bentonite seal

sand pack

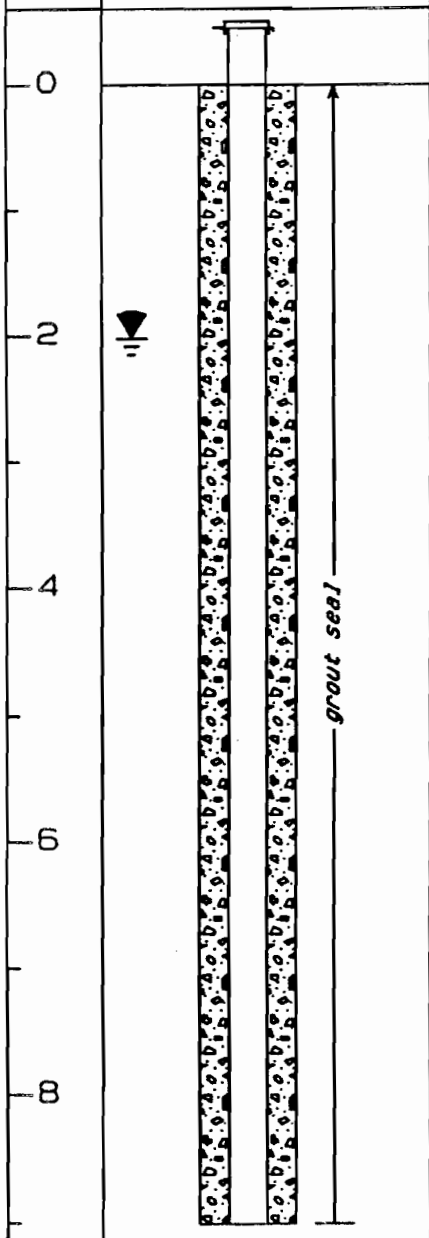
10 slot stainless steel screen

(Page 1 of 2)

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

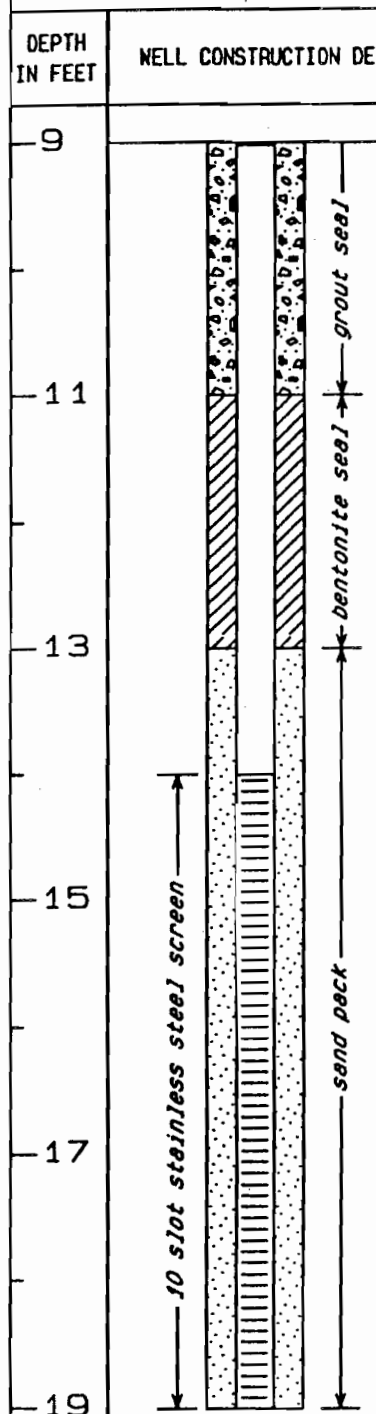
Well Number MW-2L
Coordinates E602927.72, N698010.82
Top of Casing Elevation 7.36 feet
Groundsurface Elevation 4.45 feet
Total Borehole Depth 19 feet
Total Well Depth 19 feet
Date Started 12/7/90
Date Well Completed 12/7/90



DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
0-2'			75		1	0-.3' brown red silty CLAY (10YR4/6). .3-.9' black asphalt material; dry. .9-1.4' brown silt (5YR3/4); dry. 1.4-1.5' quartzite pebble.
2-4'			65		1	2-2.2' quartzite pebble. 2.2-2.8' brown sandy silt, very fine grained sand (5YR5/2); dry. 2.8-3.3' red brown silt (10YR4/6); dry.
4-6'			65		1	4-4.5' brown red silty clay, similar to above. 4.5-5.3' CLAY, brown (5YR3/4), dry, clasts of black organic material and pebbles, stiff.
6-8'			65		1	brown CLAY as above, dry.
8-10'					10	Meadow mat, wet. Analytical sample HA3563.

OVERBURDEN WELL

PROJECT STANDARD CHLORINE WELL NUMBER MW-2L

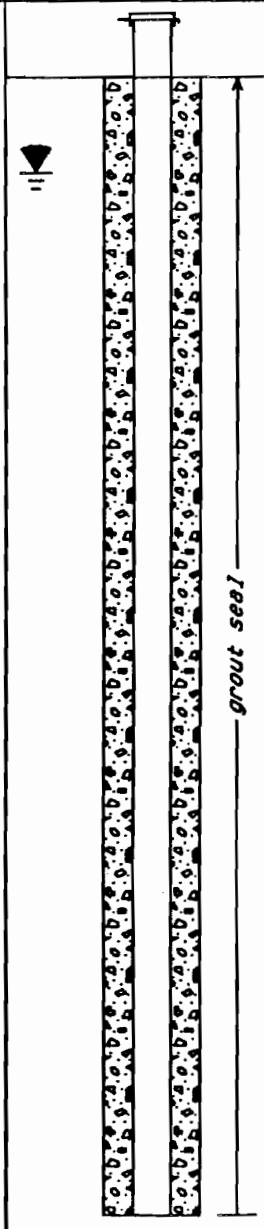


DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
9					10	
						10-12' 10-10.5' silty clay, brown with pebbles, caving. 10.5-11.2' meadow mat. 11.2-11.7' brown clay (5YR2/2), very plastic. 11.7-12' green CLAY (5G6/1), very plastic.
11			100		2	
						12-14' 12-12.25' caving. 12.25-12.8' green CLAY, moist, somewhat stiff (10G6/2). 12.8-13.3' SAND, green (10G6/2), fine to medium grained, 10% clay, moist.
13			65		BKG	
						14-16' 14-14.5' fine grained SAND, 10% clay, olive, (5Y5/6), well sorted. 14.5-16' SAND, brown gray (5YR4/1), grades from medium at top to coarse grained at bottom, fairly well sorted, subangular grains; moist.
15			100		20-50	
						16-18' 16-17' sand as above; moist. 17-18' CLAY, gray (N-5), stiff, dry.
17			100		20-50	
19						
21						

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

Well Number MW-3L
Coordinates E602725.51, N697722.83
Top of Casing Elevation 5.29 feet
Groundsurface Elevation 3.36 feet
Total Borehole Depth 18 feet
Total Well Depth 18 feet
Date Started 11/30/90
Date Well Completed 12/3/90



DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
0-2'			58			0-.3' sandy silt (5YR3/4) brown gray, bottom inch is asphaltic. .3-.7' brick material. Water at 1.8'. .7-1.2' sand with some gravel (10YR2/2) moist, fine to medium sand.
2-4'			75			Gravel and sand fill, gravel up to 2"diameter, (10YR2/2) brown-gray, some brick material and white crystals.
4-6'			100			4-5.25' sand, brown gray, coarse, well sorted, wet. 4.25-5.5' gravel, 2" diameter.
6-8'			75			6-7' chrome fill and caving, large chunks gravel and coarse sand (5YR2/2) 7-7.5' meadow mat.
8-10'			50			8-8.75' caving - chrome fill as above. 8.75-9' meadow mat.

OVERBURDEN WELL

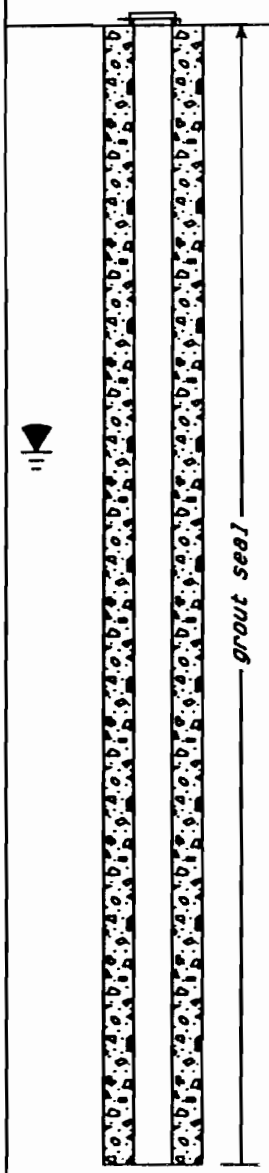
PROJECT STANDARD CHLORINE WELL NUMBER MW-3L

DEPTH IN FEET	WELL CONSTRUCTION DETAIL	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
9				50			10-12' 10-10.3' caving, chrome fill. 10.3-10.7' dark greenish gray CLAY, (5GY4/1), plastic.
11	bentonite seal			33			
13	10 slot stainless steel screen; sand pack			100			12-14' 12-.2' caving. 12.2-14' sand, green-gray (5GY2/1), medium to coarse, well sorted, top 12" 20-30% clay, 1/2" thick green clay stringer at 2".
15				100			14-16' 14-15.25' sand, green-gray (5GY2/1), coarse to very coarse, strong moth ball smell. 15.25-16' clay, stiff, green-gray (5GY2/1), strong moth ball smell.
17							
19							
21							

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

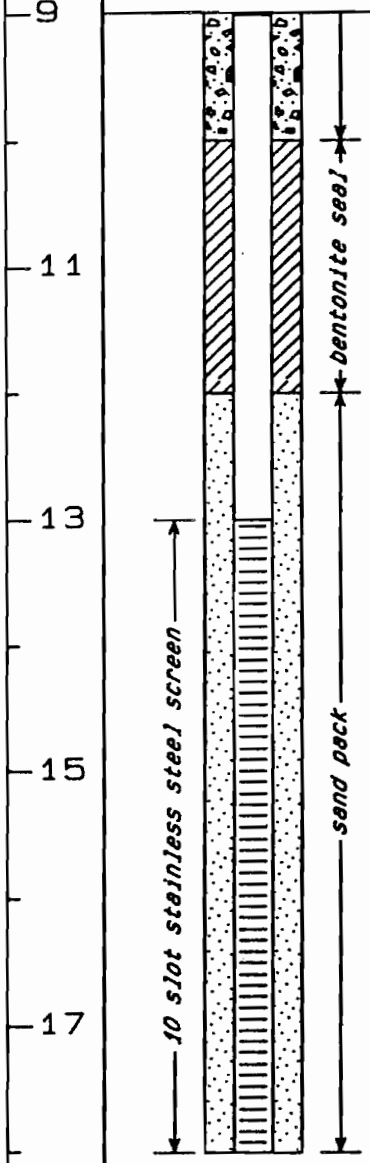
Well Number MW-4L
Coordinates E603527.45, N697967.15
Top of Casing Elevation 7.28 feet
Groundsurface Elevation 5.19 feet
Total Borehole Depth 20 feet
Total Well Depth 18 feet
Date Started 12/11/90
Date Well Completed 12/11/90



DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
0-2'			30		BKG	Silt, gravel 15%, visible slag pieces, dry, brown (5YR2/2).
2-4'			100		BKG	2-3.5' Silt, 10% sand, fine grained, dull green mineral throughout, white creamy pocket at 2.5', wet, gray (5GY6/1). 3.5-4' sand and 15% gravel, fine grained sand, 1/2" gravel, green mineral, wet, gray (5GY6/1).
4-6'			100		BKG	4-4.5' silt and gravel, 15% rounded gravel pellets, possibly from surface, specks of creamy coating, wet, gray (5GY6/1). 4.5-6' silt, green mineral throughout, wet, gray (5GY6/1).
6-8'			100		BKG	Silt as above with green mineral, gray (5GY6/1), wet.
8-10'			100		BKG	8-9.8' silt, as above, 5% gravel, green mineral; moist, gray (5GY6/1). 9.8-10' meadow mat.

OVERBURDEN WELL

PROJECT STANDARD CHLORINE WELL NUMBER MW-4L



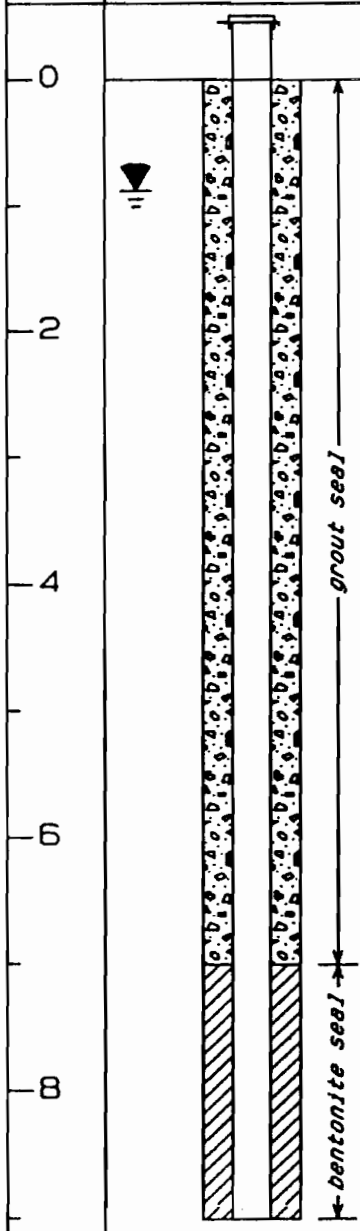
DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
9			100		BKG	
						10-12' 10-10.5' caving, gray silt with green mineral, wet. 10.5-10.7' meadow mat. 10.7-11' sand, fine grained, 10% clay, moist, brown (5YR3/2).
11			50		BKG	
						12-14' 12-13.3' caving, sand and gravel fill and meadow mat. 13.3-14' sand, fine grained to very fine grained; green clay (clayey sand) stringer 13.3-13.6', moist, gray (5Y6/1).
13			100		BKG	
						14-16' 14-14.4' caving. 14.4-15' sand, fine to medium grained, well sorted mostly quartz, subangular, moist, appears stained gray (N-2). 15-15.5' sand, fine grained, well sorted, quartz, moist, gray (5YR6/1).
15			75		BKG	
						16-18' 16-17.3' caving. 17.3-18' sand, fine to medium grained, well sorted, strong odor, moist, gray (5YR6/1).
17			100		BKG	
						18-20' 18-18.6' caving. 18.6-20' clay, slightly plastic, fairly stiff, top 2" contains chunks of red shale, moist, gray (N-5).
19			100		BKG	
21						

(Page 1 of 2)

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

Well Number MW-5L
Coordinates E602923.55, N698260.23
Top of Casing Elevation 6.14 feet
Groundsurface Elevation 3.71 feet
Total Borehole Depth 17 feet
Total Well Depth 17 feet
Date Started 12/3/90
Date Well Completed 12/4/90

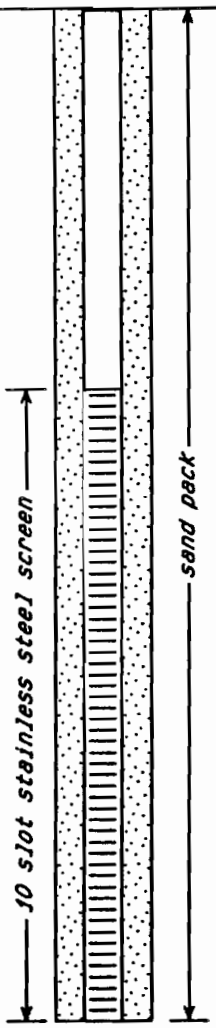


DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READINGS	DESCRIPTION
0						0-2' Very resistant, augered through.
2			63			2-4' 2-2.7' gravel slag fill. 2.7-2.8' black asphalt material. 2.8-3.25' sandy fill with pockets of yellow silt. Water at 3 feet.
4			100			4-6' 4-4.5' black sandy gravel fill, wet. 4.5-6' sandy clay, green gray (5GY6/1) moist, plastic, 10% sand, green is mottled.
6			33			6-8' Some sandy gravel fill and wood chunks. Possible beginning of mat.
8			0			8-10' No recovery, chunk of wood stuck.

OVERBURDEN WELL

PROJECT STANDARD CHLORINE WELL NUMBER MW-5L

DEPTH IN FEET	WELL CONSTRUCTION DETAIL	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
9				0			
							10-12' 10-10.1' meadow mat. 10.1-10.3' clay. 10.3-11.25' clayey sand, fine to medium grain, brown gray (5YR4/1) 20-30% sand, black staining on sand.
11				63			
							12-14' Sand as above, 10% clay.
13				50			
							14-16' 14-14.5' coarse sand, no clay, brown-gray (5YR4/1). 14.5-14.8' clay, gray.
15				42			
							16-17' Clay.
17							
19							
21							

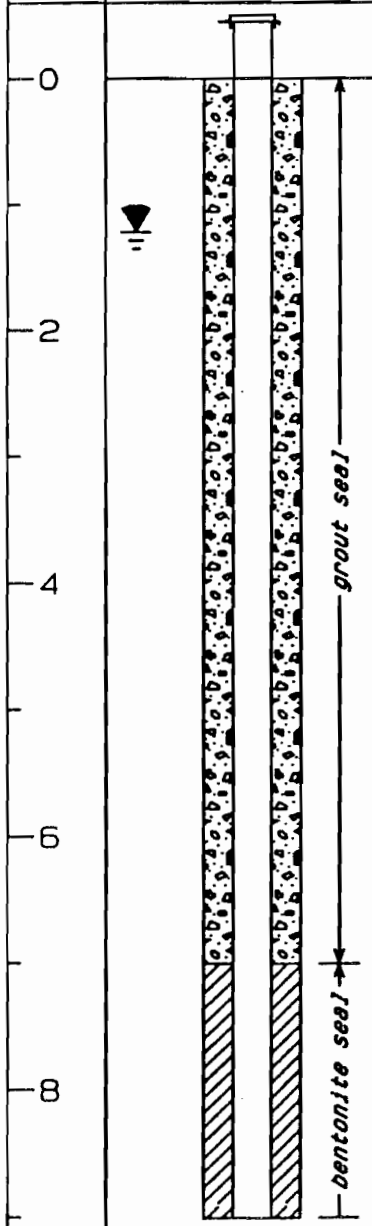


(Page 1 of 2)

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

Well Number MW-6L
Coordinates E603531.37, N698540.14
Top of Casing Elevation 6.82 feet
Groundsurface Elevation 4.19 feet
Total Borehole Depth 16 feet
Total Well Depth 16 feet
Date Started 12/5/90
Date Well Completed 12/5/90



DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
0						
			75		BKG	0-2' Slag, sand and gravel, gray, black water at .5', (5YR2/1).
2			100		BKG	2-4' 2-2.8' slag as above. 2.8-4' sandy clay, 40% sand, fine grained, clay, (5GY7/4), green.
4			100		BKG	4-6' 4-4.9' sand and gravel fill. 4.9-5.1' sandy clay as above. 5.1-6' gravel and sand fill, black
6			33		BKG	6-8' Gravel and sand fill as above, meadow mat in tip of spoon.
8			100		BKG	8-10' 8-8.3' gravel and sand, slag, caving. 8.3-8.9' meadow mat, stained black. 8.9-9.3' silty clay, wet, plastic, (5Y4/1), gray.

OVERBURDEN WELL

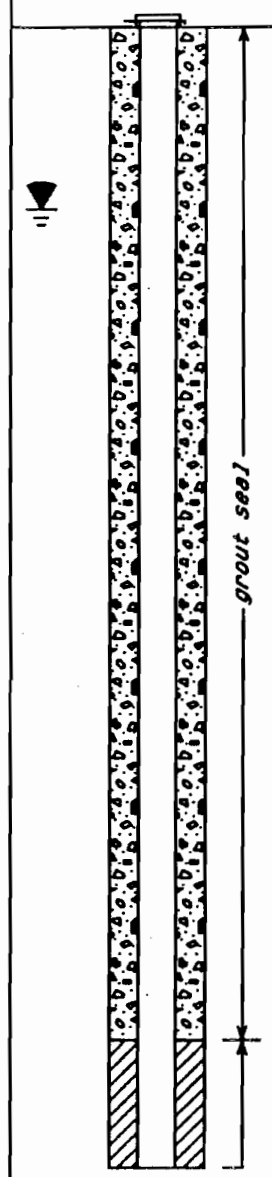
PROJECT STANDARD CHLORINE WELL NUMBER MW-6L

DEPTH IN FEET	WELL CONSTRUCTION DETAIL	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
9							9.3-9.6' clayey sand, gray, (5Y4/1), fine grained sand, 40% clay. 9.6-9.8' silty clay as above 9.8-10' clayey sand, as above.
				100		BKG	
							10-12' Fine grained sand, 20% clay, 2" pebble at bottom prevented recovery, sand dark gray (5YR2/1).
11				25		BKG	
							12-14' 12-12.4' caving. 12.4-14' dark gray fine to medium grained sand N-4, N-3.
13				100		BKG	
							14-16' 14-14.75' caving. 14.75-15.75' fine grained sand, as above, strong odor. 15.75-16' clay, gray (5YR4/1), stiff, hard.
15	10 slot stainless steel screen / sand pack			100		20	
17							
19							
21							

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

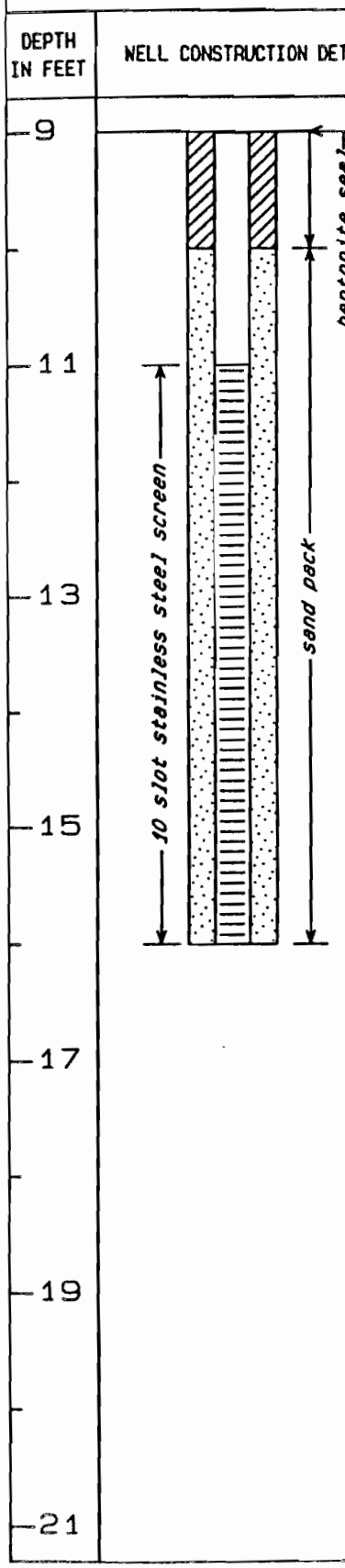
Well Number MW-7L
Coordinates E603657.55, N698602.08
Top of Casing Elevation 6.90 feet
Groundsurface Elevation 4.26 feet
Total Borehole Depth 16 feet
Total Well Depth 16 feet
Date Started 12/11/90
Date Well Completed 12/12/90



DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
0-2'			50		N/A	0-.4' silt, moist, brown (5YR3/2). .4-.7' silt and gravel, 40% gravel fill, moist, brown (5YR3/2). .7-1' gravel fill, >1/2" gravel, wet, gray (N-6).
2-4'			20		N/A	2-2.4' gravel fill with silt, water very high in hole (within 3"), wet, brown (5YR3/4).
4-6'			50		N/A	4-4.3' gravel fill, wet, brown (5YR3/4). 4.3-5' meadow mat, strong odor and wicked looking fluid, gray (N-2).
6-8'			50		80	Meadow mat as above, wet.
8-10'			50		80	8-8.7' meadow mat as above. 8.7-9' sand, fine grained, well sorted, 15% clay, moist, gray (5G6/1).

OVERBURDEN WELL

PROJECT STANDARD CHLORINE WELL NUMBER MW-7L



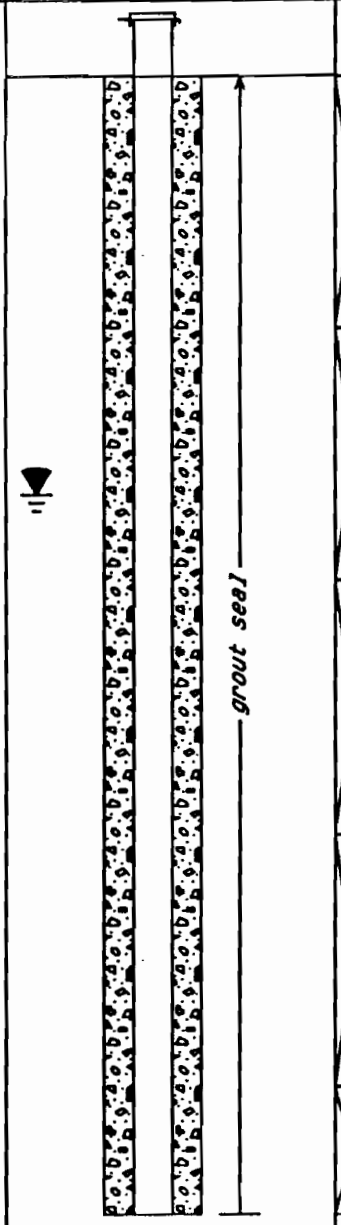
SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
		50		80	10-12' 10-10.3' caving, meadow mat. 10.3-11.7' sand, fine grained, well sorted, 10% clay, clay layer and black staining at 10.6-10.7', strong odor, moist, gray (5G6/1).
		85		60	
					12-14' 12-12.5' caving. 12.5-14' sand, fine grained, well sorted, no clay, strong odor, stained brown in places, moist, gray (N-5).
		100		75	
					14-16' 14-14.5' caving. 14.5-15.6' sand, fine grained as above, strong odor and staining, moist, gray (5YR4/1). 15.6-16' clay, stiff, moist, gray (N-4).
		100		120	

HNU readings on bottled samples

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

Well Number MW-8L
Coordinates E603960.19, N698755.40
Top of Casing Elevation 8.58 feet
Groundsurface Elevation 5.78 feet
Total Borehole Depth 19 feet
Total Well Depth 19 feet
Date Started 12/5/90
Date Well Completed 12/5/90



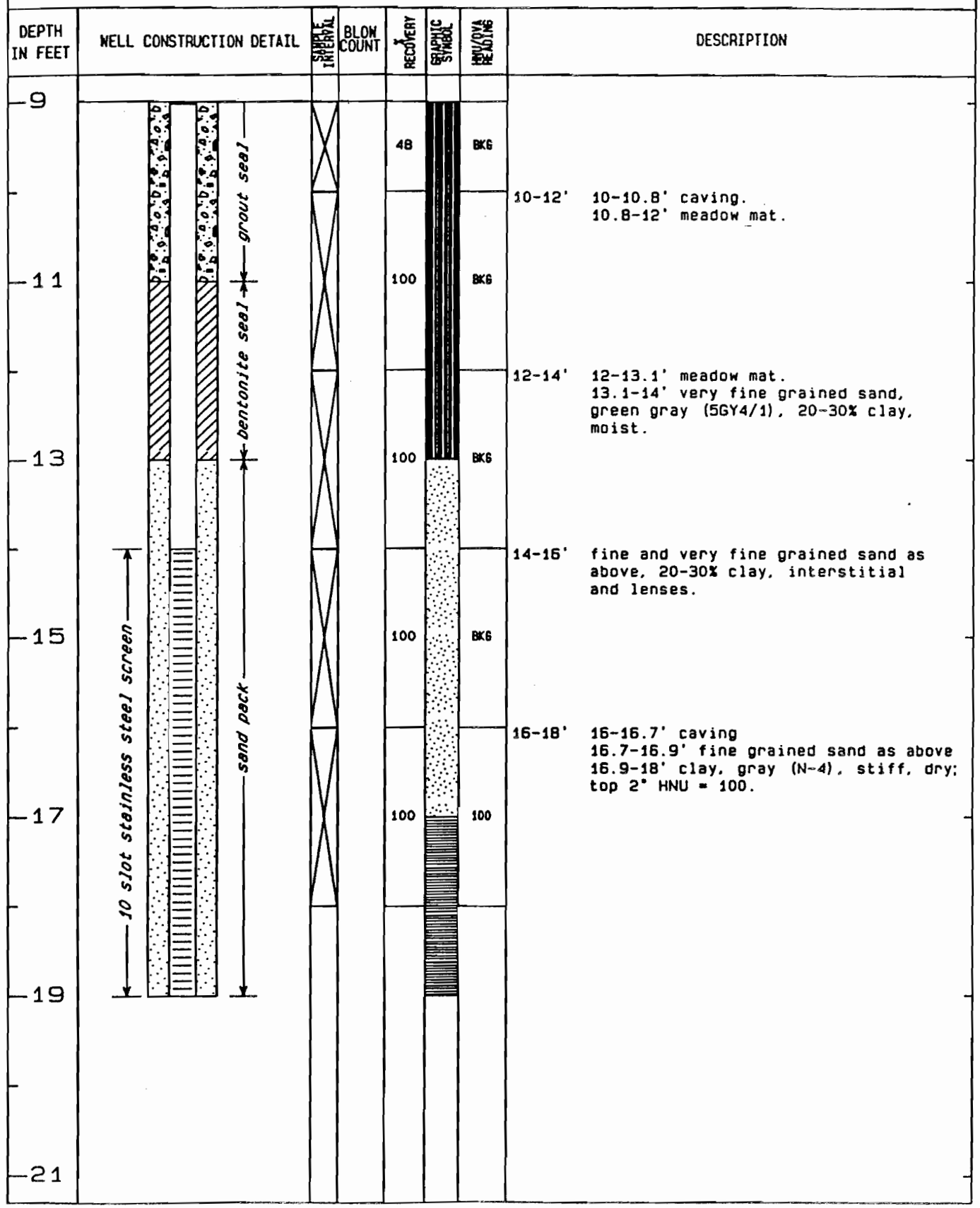
DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
0-2'			100		BKG	0-.3' sand and gravel fill. .3-1.3' sandy silt, 20% sand, fine grained, brown (5YR3/4). 1.3-1.4' slag with green sand. 1.4-2' sandy silt, 10-20% sand, brown (5YR4/1).
2-4'			100		BKG	2-4' 40% silt, 30% sand and 30% gravel, brown (5YR4/1) gravel has slag pieces; also pieces of paper, wood, green staining on silt and pebbles, moist.
4-6'			100		5	4-4.8' fill as above. 4.8-5.3' sand with about 20% gravel (5YR3/2), wet. 5.3-6' clay, gray (N-4), moist, plastic, stained black at 16-18", mothball odor.
6-8'			100		BKG	Meadow mat, top 10" is very degraded to black clayey material.
8-10'			48		BKG	Meadow mat.

(Page 2 of 2)

OVERBURDEN WELL

PROJECT STANDARD CHLORINE

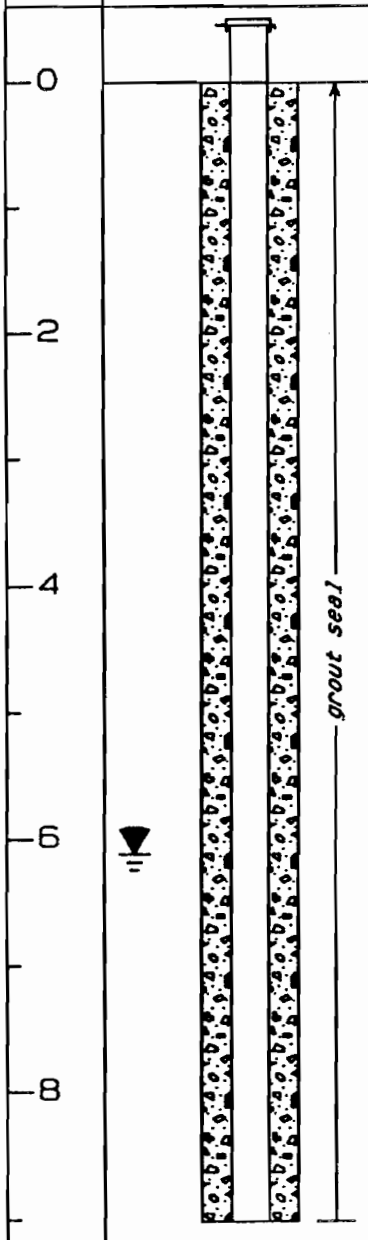
WELL NUMBER MW-8L



OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

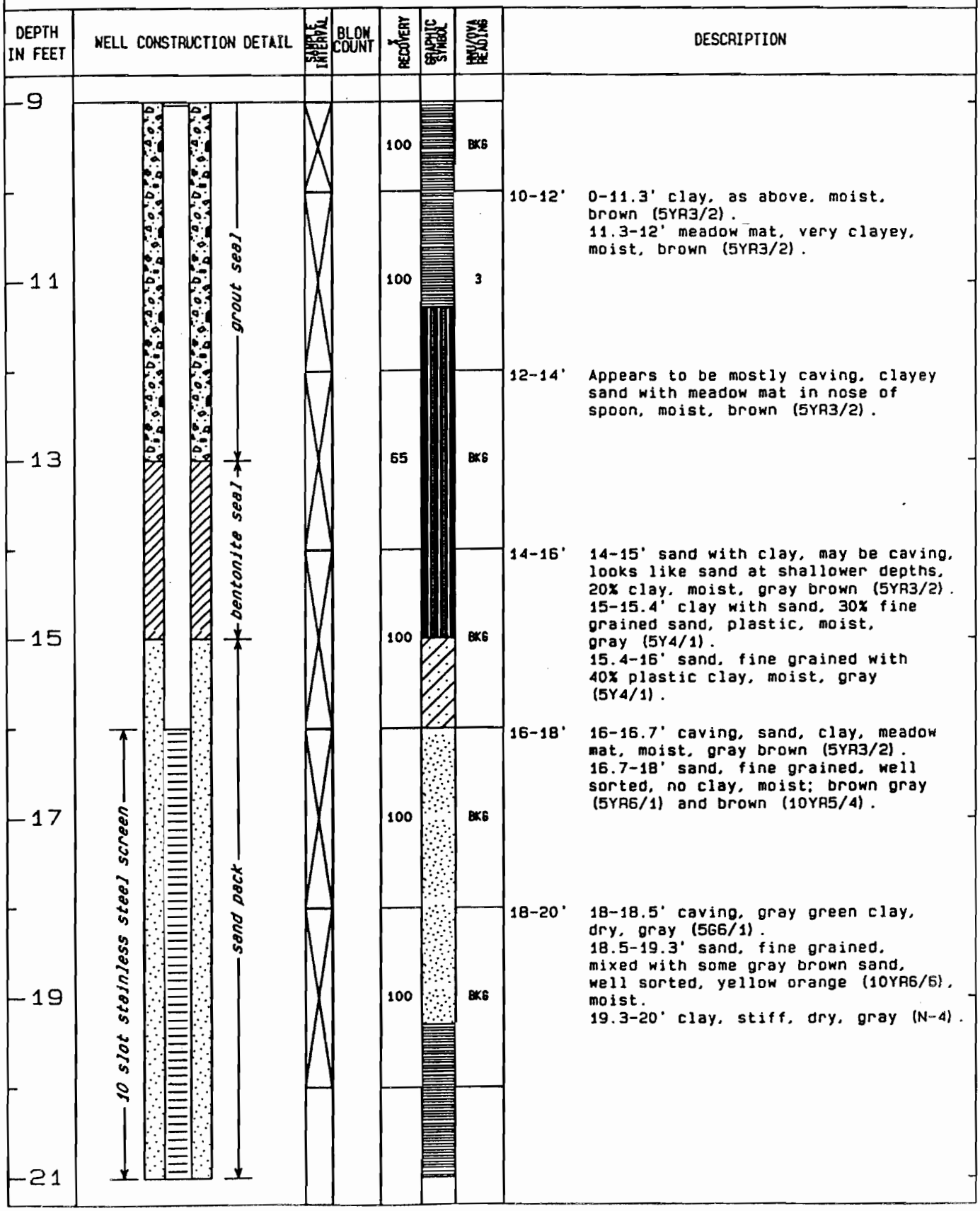
Well Number MW-9L
Coordinates E604139.06, N698262.42
Top of Casing Elevation 10.09 feet
Groundsurface Elevation 7.55 feet
Total Borehole Depth 21 feet
Total Well Depth 21 feet
Date Started 12/10/90
Date Well Completed 12/10/90



DESCRIPTION	
0-2'	SILT, sandy, fine grained, pockets of green crystallization, brown (5YR3/2), dry.
2-4'	Sand, fine grained, 30% silt, micaceous, pockets of green mineral, brown (5YR3/2), dry.
4-6'	Sand, fine grained, 25% clay, pockets of green mineral, moist, brown (5YR3/2).
6-8'	Sand and clay, 50/50, fine grained sand, wet, brown (5YR3/2).
8-10'	8-9' sand, clayey, 40% clay, fine grained sand, plastic clay, pocket of yellow green mineral at 8 feet. 9-10' clay, plastic, 30% sand at 9', 15% sand at 10', some clasts of red and black clay, wet, brown (5YR3/2)

OVERBURDEN WELL

PROJECT STANDARD CHLORINE WELL NUMBER MW-9L

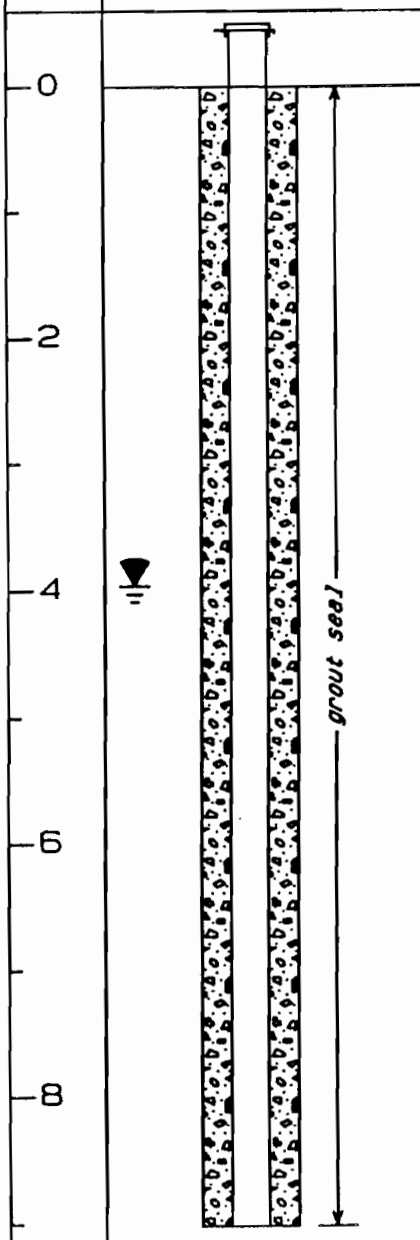


(Page 1 of 2)

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

Well Number MW-10L
Coordinates E603775.85, N698104.42
Top of Casing Elevation 8.12 feet
Groundsurface Elevation 5.31 feet
Total Borehole Depth 17 feet
Total Well Depth 16 feet
Date Started 12/10/90
Date Well Completed 12/10/90



DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
0-2'			40		BKG	Silty sand, 30% silt, fine grained sand, dry, brown (5YR4/4).
2-4'			100		BKG	Silt, 15% sand, some pebbles, pockets of green mineral; dry; brown, (5YR3/2).
4-6'			70		BKG	4-4.55' silt, as above. 4.55-5.4' sand and gravel, 50% gravel, 35% sand, fine grained, 15% clay, pockets of green mineral, wet, brown (5YR3/2).
6-8'			100		BKG	Sand and gravel as above, wet, brown (5YR3/2).
8-10'			100		BKG	8-9' gravelly silt, 25% gravel, stringer of dull gray mineral at 9', moist, brown, (5YR3/2). 9-10' meadow mat, moist.

OVERBURDEN WELL

PROJECT STANDARD CHLORINE WELL NUMBER MW-10L

DEPTH IN FEET	WELL CONSTRUCTION DETAIL	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
9							
				100		BKG	
							10-12' 10-10.9' caving, sand and gravel, wet, brown gray. 10.9-11.5' meadow mat, moist. 11.5-12' sandy clay, very plastic, very fine grained sand, 30% pieces of mat, moist, green gray (5G4/1).
11				100		BKG	
							12-14' 12-12.4' caving, sand and gravel, wet, brown gray. 12.4-13.6' sandy clay/clayey sand, 30% fine grained sand/30% clay; some clasts of red clay, dry, green gray (5G4/1).
13				80		BKG	
							14-16' 14-14.4' caving, sand and gravel. 14.4-14.7' sand, fine grained, well sorted, moist, gray (5Y4/1). 14.7-15.1' sand, fine grained, well sorted, moist, brown (10YR5/4). 15.1-16' silty sand, fine grained sand, 35-40% silt, dry, brown (5YR3/4).
15				100		BKG	
							16-17' 16-16.2' caving, wet. 16.2-16.6' sandy silt, very fine grained sand, 30%; moist, brown (5YR3/4). 16.6-17' silty clay, very stiff, crumbly, dry, brown (5YR3/4).
17				100		BKG	
19							
21							

10 slot stainless steel screen

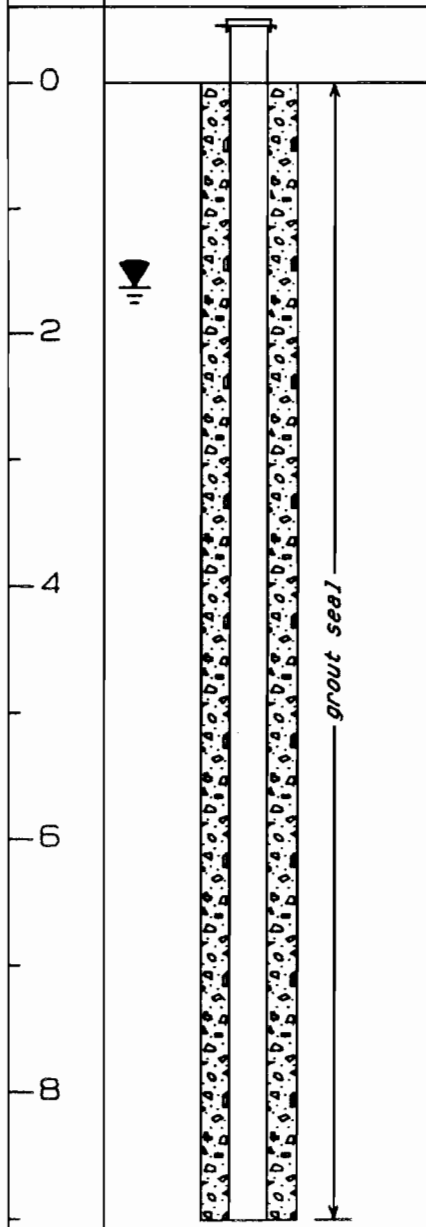
bentonite seal

sand pack

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

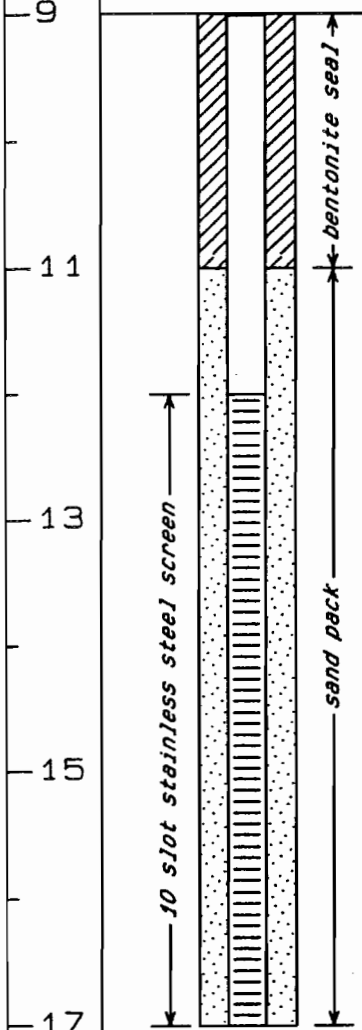
Well Number MW-11L
Coordinates E603816.29, N698489.69
Top of Casing Elevation 7.88 feet
Groundsurface Elevation 4.74 feet
Total Borehole Depth 18 feet
Total Well Depth 17 feet
Date Started 12/13/90
Date Well Completed 12/13/90



	DESCRIPTION
0-2'	0-.8' Silt with chrome slag, moist, brown (10YR4/2). .8-1.6' sand and gravel, black coating, odor, moist, black.
2-4'	2-2.7' sand and gravel fill, as above, odor, wet, black. 2.7-2.95' sand, fine grained, well sorted, 5% gravel (pea sized), moist, gray (N-5). 2.95-3.8' sand, fine grained, well sorted, 5% gravel, moist, brown (5YR5/2).
4-6'	Slag fill, coated black, odor, wet, black.
6-8'	6-6.5' slag fill, sand, black coating, odor, wet, black. 6.5-7.5' sand, fine grained, clayey in pockets, 30% coated, strong odor, wet, black.
8-10'	8-8.3' caving, wet. 8.3-9.1' meadow mat, contains 5% sand and clay, moist, dark gray (5YR4/1).

OVERBURDEN WELL

PROJECT STANDARD CHLORINE WELL NUMBER MW-11L

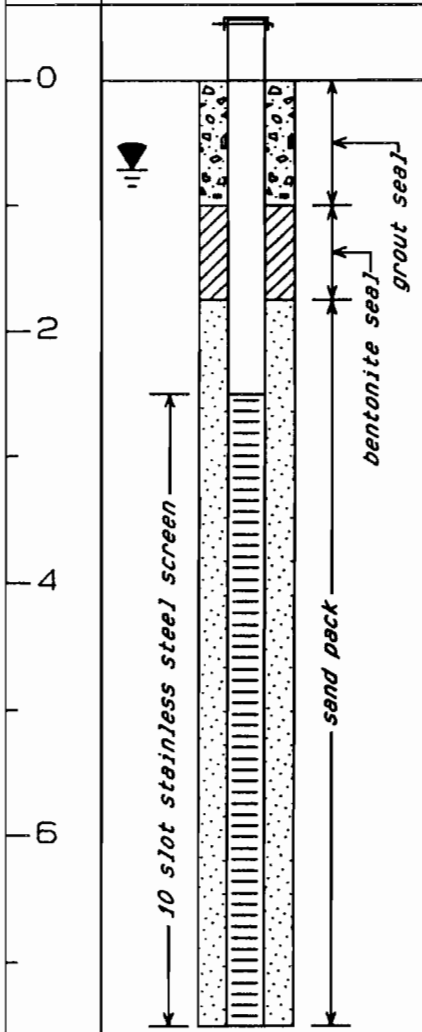


DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
9						
			55		20-50	
						10-12' 10-10.6' meadow mat, moist. 10.6-11.3' sandy clay, 40% sand, plastic, stained black, odor, moist, gray (5YR2/1). 11.3-12' sand, fine grained, well sorted, stiff clay lense at 11.9-12', moist, gray (5Y6/1).
11			100		20-50	
						12-14' 12-12.5' caving. 12.5-13.7' sand, fine grained, very well sorted, no clay, wet, gray (5YR6/1).
13			85		20	
						14-16' 14-14.4' caving. 14.4-15' sand, fine grained, well sorted, gray (N-5). 15.2-15' clayey sand, clay 25-30%, moist, gray (N-5).
15			100		30-70	
						16-18' 16-16.2' caving. 16.2-16.6' sandy clay, 15% fine grained sand, dry, gray (5YR6/1). 16.6-18' clay, stiff, slightly plastic, dry, gray (5YR4/1). HNU readings fell from 110 at the top of the clay to 10 at the base.
17			100		10-110	
19						
21						

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

Well Number MW-11U
Coordinates E603822.89, N698493.74
Top of Casing Elevation 7.2 feet
Groundsurface Elevation 4.64 feet
Total Borehole Depth 7.5 feet
Total Well Depth 7.5 feet
Date Started 12/13/90
Date Well Completed 12/13/90

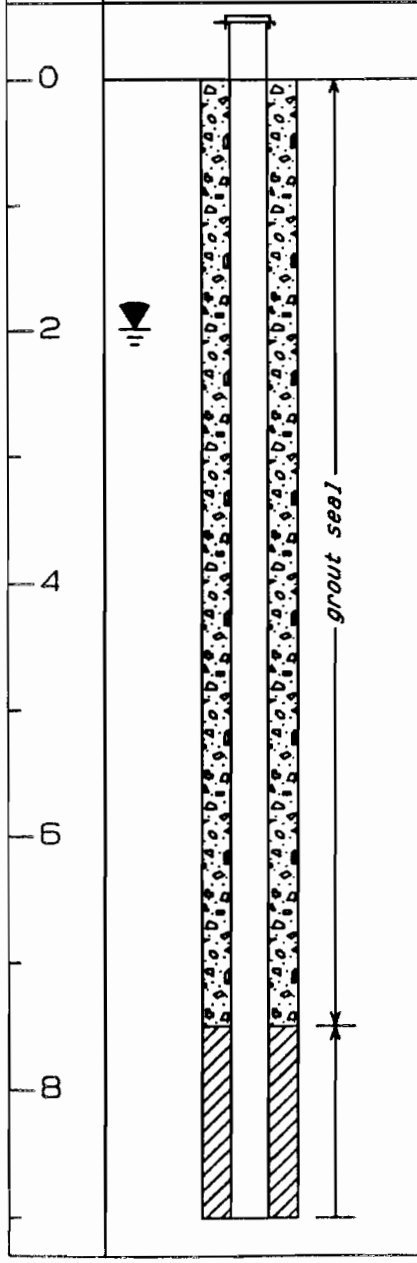


DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
0-2'			80		15-50	0-.8' Silt with chrome slag, moist, brown (10YR4/2). .8-1.6' sand and gravel, black coating, odor, moist, black.
2-4'			90		20-50	2-2.7' sand and gravel fill, as above, odor, wet, black. 2.7-2.95' sand, fine grained, well sorted, 5% gravel (pea sized), moist, gray (N-5). 2.95-3.8' sand, fine grained, well sorted, 5% gravel, moist, brown (5YR5/2).
4-6'			80		10	Slag fill, coated black, odor, wet, black.
6-8'			100		20-110	6-6.5' slag fill, sand, black coating, odor, wet, black. 6.5-7.5' sand, fine grained, clayey, in pockets, 30% coated, strong odor, wet, black.

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

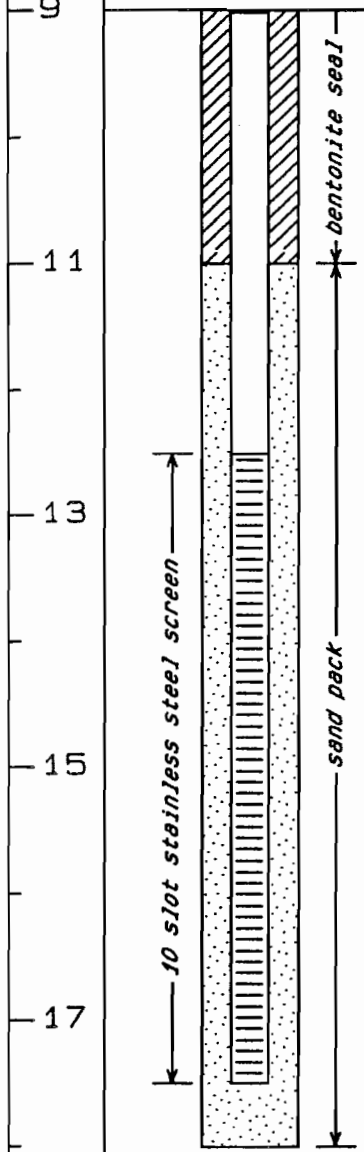
Well Number MW-12L
Coordinates E603663.18, N698342.52
Top of Casing Elevation 6.99 feet
Groundsurface Elevation 4.52 feet
Total Borehole Depth 18 feet
Total Well Depth 17.5 feet
Date Started 12/12/90
Date Well Completed 12/12/90



DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
0-2'			80		BKG	Sand and gravel fill, wet at 1', brown (5YR3/4).
2-4'			25		BKG	2-2.3' gravel fill, strong odor. 2.3-3.5' odor, black coal tarry coating, sheen, wet, brown (5YR3/4).
4-6'			15		1	Gravel fill, odor, some lumber, wet, black.
6-8'			70		10-20	6-6.6' gravel fill as above, odor, wet, black. 6.6-7.4' meadow mat, moist.
8-10'			50		15	8-8.8' caving, wet, black. 8.8-9' meadow mat.

OVERBURDEN WELL

PROJECT STANDARD CHLORINE WELL NUMBER MW-12L



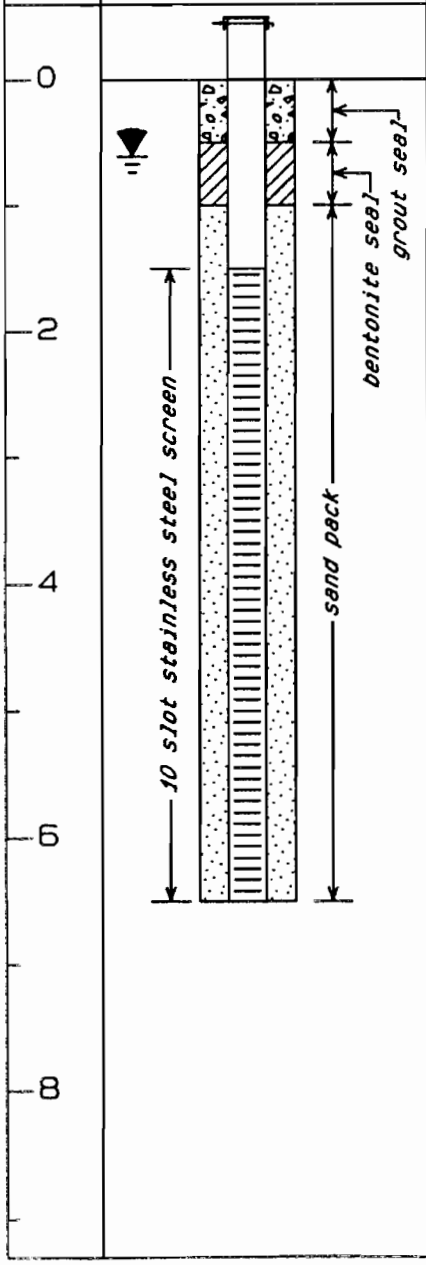
DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
9						
			50		15	
						10-12' 10-10.6' caving. 10.6-11.4' sand, fine to very fine grained, well sorted, 20% clay, clay stringer at 11.1-11.2', moist, gray (5Y4/1).
11			70		5-15	
						12-14' 12-12.9' caving. 12.9-13.8' sand, fine grained, well sorted, no clay, moist, brown (10YR5/4).
13			90		30	
						14-16' 14-14.8' caving. 14.8-15' sand, fine grained, clayey, up to 20% in lenses, moist, gray (N-4). 15-15.1' black staining. 15.4-15.5' clay. 15.5-15.8' sand. 15.8-15.9' clay, gray, stiff.
15			100		50-80	
						16-18' 16-16.6' caving. 16.6-16.9' clay, stiff, crumbly, dry, gray (5Y4/1).
17			45		20	
19						
21						

(Page 1 of 1)

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

Well Number MW-12U
Coordinates E603664.83, N698337.61
Top of Casing Elevation 8.13 feet
Groundsurface Elevation 4.55 feet
Total Borehole Depth 6.5 feet
Total Well Depth 6.5 feet
Date Started 12/13/90
Date Well Completed 12/13/90

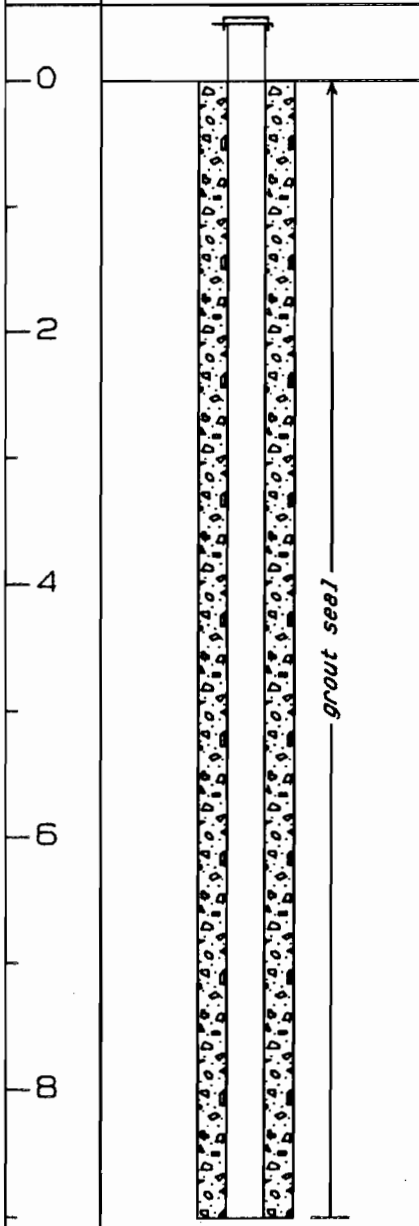


DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
0-2'			80		BKG	Sand and gravel fill, wet at 1', brown (5YR3/4).
2-4'			25		BKG	2-2.3' gravel fill, strong odor. 2.3-3.5' odor, black coal tarry coating, sheen, wet, brown (5YR3/4).
4-6'			15		1	Gravel fill, odor, some lumber, wet, black.
6-8'			70		10-20	6-6.6' gravel fill as above, odor, wet, black.

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

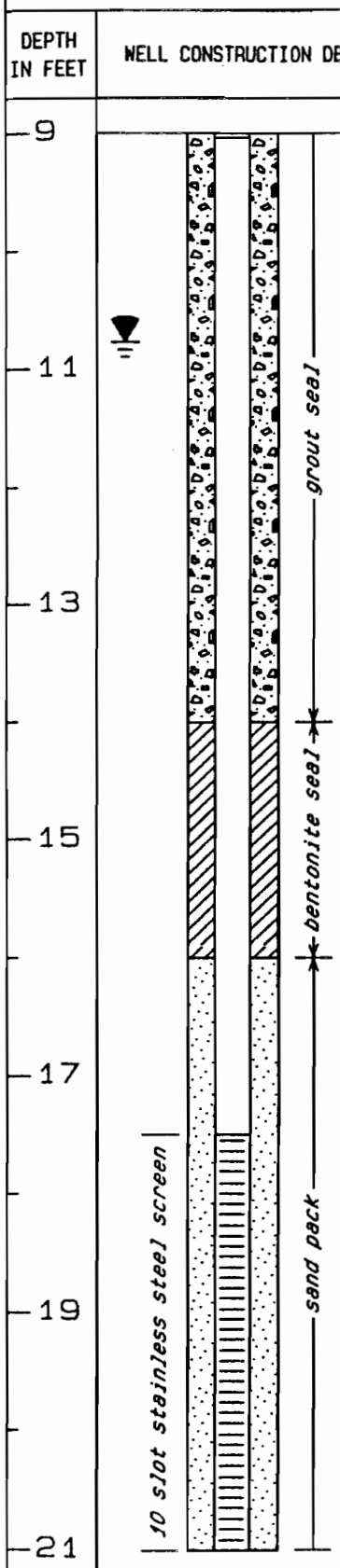
Well Number MW-13L
Coordinates E698375.52, N663923.15
Top of Casing Elevation 11.59 feet
Groundsurface Elevation 9.01 feet
Total Borehole Depth 22.5 feet
Total Well Depth 22.5 feet
Date Started 12/17/90
Date Well Completed 12/17/90



DESCRIPTION	
0-2'	Silt with fine grained sand, chrome slag pellets, dry, brown (5YR4/4).
2-4'	2-2.3' silt, dry, brown (5YR3/4). 2.3-2.8' sand, fine grained, black with white crystals, dry, black. 2.8-3.1' silt, moist, brown (5YR3/4). 3.1-3.4' sand, fine grained, moist gray (N-4).
4-6'	4-4.2' caving, moist. 4.2-6' sand, fine to medium grained with 10% gravel, green pockets mineral, odor DCB, moist, gray (5GY4/1).
6-8'	Sand as above, odor DCB, moist, gray (5GY4/1).
8-10'	Sand, as above, odor, moist, gray (5GY4/1).

OVERBURDEN WELL

PROJECT STANDARD CHLORINE WELL NUMBER MW-13L



SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
		100		2	
10-12'		100		5	Sand as above, 15% clay, bits of paper, moist, gray (5GY4/1).
12-14'		100		19	12-12.65' sand as above, black staining at 12.65', moist, gray (5GY4/1). 12.65-13' clay, moist, gray-brown. 13-14' meadow mat, moist.
14-16'		100		5	14-14.6' meadow mat. 14.6-15.3' sandy clay, 30% sand, fine grained, odor, wet, gray (5YR4/1). 15.3-16' sand, fine grained, well sorted, moist, gray (N-6).
16-18'		100		6	16-17.2' sand, fine grained, well sorted, 10% clay, odor, moist, gray (N-6). 17.2-18' sand, fine grained, well sorted, no clay, odor, moist, brown gray (5YR4/1).
18-20'		100		30	18-19' sand, very fine grained, clayey, up to 40%, caving?, moist, gray (N-6). 19-20' sand, fine to very fine grained, black staining 19.4-19.7', odor, moist, brown gray (5YR4/1).
20-22'		100		25-50	20-20.6' sand caving, moist, gray (N-6). 20.6-21.9' clayey sand, fine grained sand, 15% clay, clay stringer 21.4-21.5', black staining.

OVERBURDEN WELL

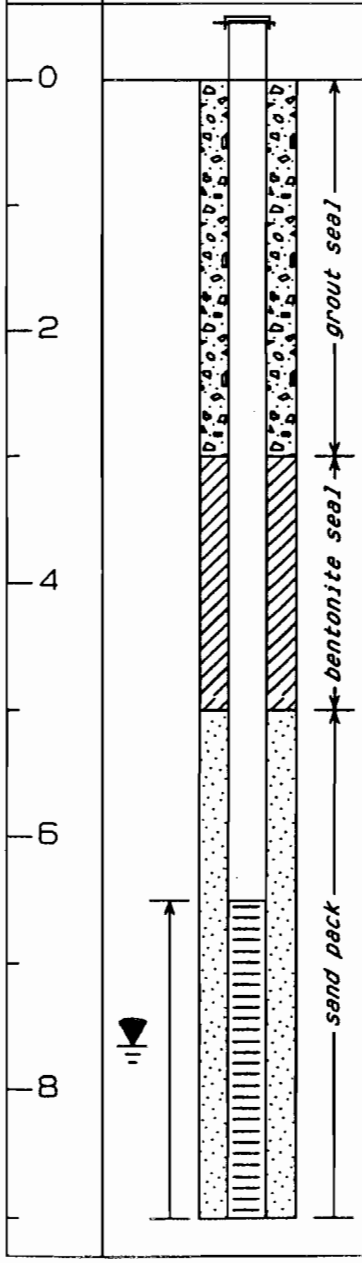
PROJECT STANDARD CHLORINE WELL NUMBER MW-13L

DEPTH IN FEET	WELL CONSTRUCTION DETAIL	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
21	sand pack			100		25-50	particularly 21.5-21.8', strong odor, moist, gray (N-3). 21.8-22' clay, stiff, dry, gray (N-5). *HNU readings on bottled samples.*
23							
25							
27							
29							
31							
33							

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

Well Number MW-13U
Coordinates E603931.08, N698380.01
Top of Casing Elevation 11.26 feet
Groundsurface Elevation 9.14 feet
Total Borehole Depth 11.5 feet
Total Well Depth 11.5 feet
Date Started 12/17/90
Date Well Completed 12/17/90



DESCRIPTION	
0-2'	Silt with fine grained sand, chrome slag pellets, dry, brown (5YR4/4).
2-4'	2-2.3' silt, dry, brown (5YR3/4). 2.3-2.8' sand, fine grained, black with white crystals, dry, black. 2.8-3.1' silt, moist, brown (5YR3/4). 3.1-3.4' sand, fine grained, moist gray (N-4).
4-6'	4-4.2' caving, moist. 4.2-6' sand, fine to medium grained with 10% gravel, green pockets mineral, odor dCB, moist, gray (5GY4/1).
6-8'	Sand as above, odor dCB, moist, gray (5GY4/1).
8-10'	Sand, as above, odor, moist, gray (5GY4/1).

OVERBURDEN WELL

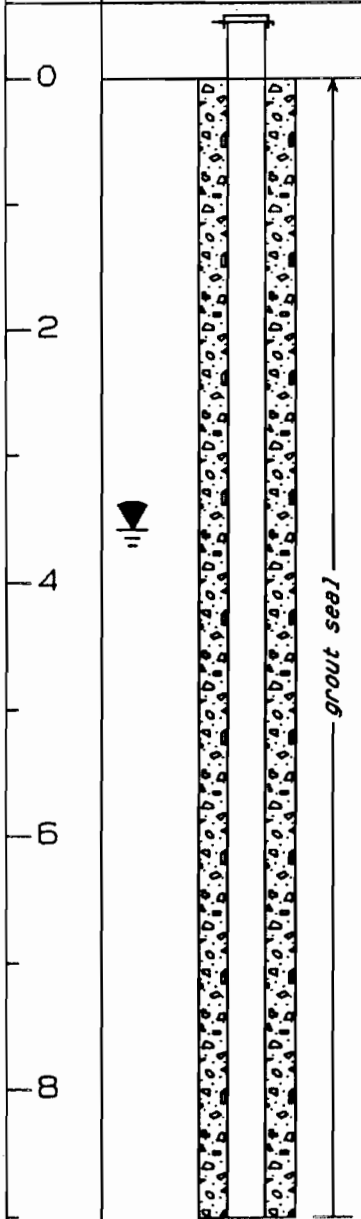
PROJECT STANDARD CHLORINE WELL NUMBER MW-13U

DEPTH IN FEET	WELL CONSTRUCTION DETAIL	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
9							
	sand pack			100		2	
							10-12' Sand as above, 15% clay, bits of paper, moist, gray (5GY4/1).
11				100		5	
13							
15							
17							
19							
21							

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

Well Number MW-14L
Coordinates E604031.04, N698567.13
Top of Casing Elevation 7.99 feet
Groundsurface Elevation 5.82 feet
Total Borehole Depth 18 feet
Total Well Depth 18 feet
Date Started 12/17/90
Date Well Completed 12/17/90

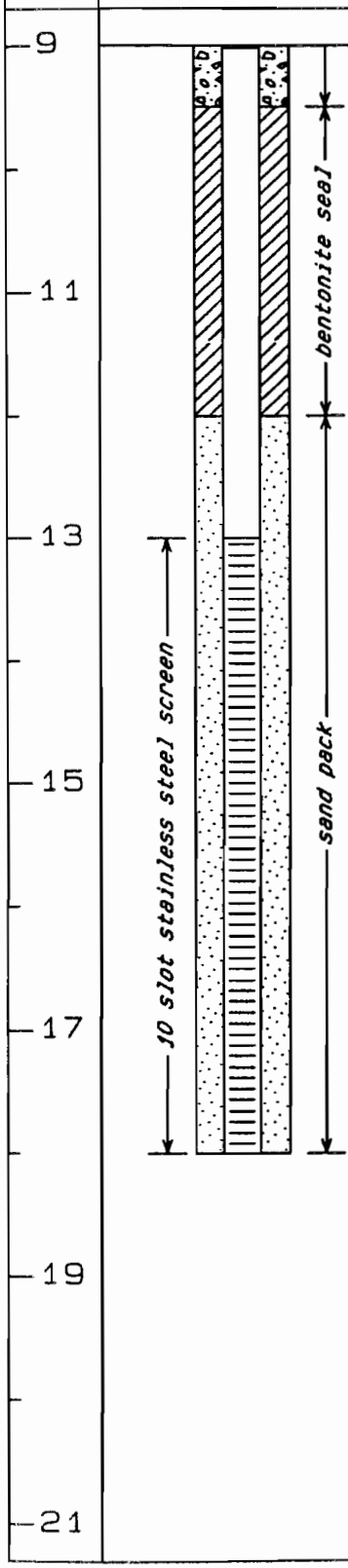


DEPTH IN FEET	% RECOVERY	HNU/OVA READING	DESCRIPTION
0-2'	40	2-5	Silt with slag pellets, moist, brown (5YR3/4).
2-4'	70	BKG	2-2.3' silt and slag, caving, wet, brown (5YR3/4). 2.3-2.9' gravel and sand fill, gravel 1/2" diameter, medium grained sand 40%, brown (10YR6/6). 2.9-3.4' silt and gravel, moist, brown (10YR4/2).
4-6'	55	BKG	4-4.4' caving, slag pellets. 4.4-5.1' silt and gravel as above, lumber, wet, brown (10YR4/2).
6-8'	100	15	6-6.5' sand, medium to coarse grained, fragments of brick, small quartz pebbles, gray brown (5YR4/1). 6.5-7.5' slag pellets, wet. 7.5-8' sand, medium grained, well sorted, stained black at 8', wet, gray brown (10YR4/2).
8-10'	100	2-18	8-8.4' gravel caving, wet, gray (N-4). 8.4-10' meadow mat, bottom at 10' is quite woody, rest is very clayey, moist, gray (N-4).

OVERBURDEN WELL

PROJECT STANDARD CHLORINE

WELL NUMBER MW-14L

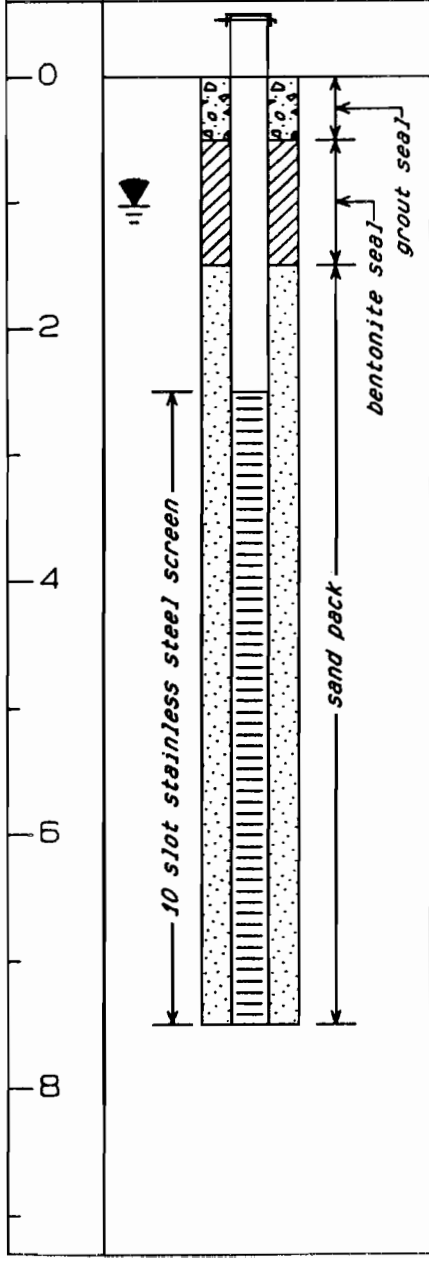


10-12'	10-10.3' gravel caving. 10.3-10.6' clay, very plastic, sticky, odor, moist, gray (5YR2/1). 10.6-11' clay, sand and meadow mat, moist, gray (5YR2/1). 11-12' meadow mat, egg odor, grassy, moist.
12-14'	12-12.5' clay and meadow mat, caving, gray (N-3). 12.5-12.7' sand and meadow mat, fine grained, caving, dry, gray (N-4). 12.7-13.4' sand and clay, 50/50, fine grained, dry, gray (N-6). 13.4-14' sand, fine grained, well sorted, 10% clay, moist, gray (N-6).
14-16'	14-15' sand, fine grained, well sorted, moist, gray (N-6). 15-15.4' sand and clay 50/50, fine grained sand with interstitial clay, odor, dry, gray (N-6).
16-18'	16-16.5' sand and meadow mat, caving wet, gray (N-6). 16.5-16.7' clay, sandy, 20% fine grained sand, moist, gray (N-6). 16.7-18' clay, fairly stiff and crumbly, strong odor, slightly moist, gray (N-5). HNU 60 ppm at top of clay, 20 ppm at bottom.

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

Well Number MW-14U
Coordinates E604027.39, N698573.33
Top of Casing Elevation 8.27 feet
Groundsurface Elevation 5.59 feet
Total Borehole Depth 7.5 feet
Total Well Depth 7.5 feet
Date Started 12/17/90
Date Well Completed 12/18/90

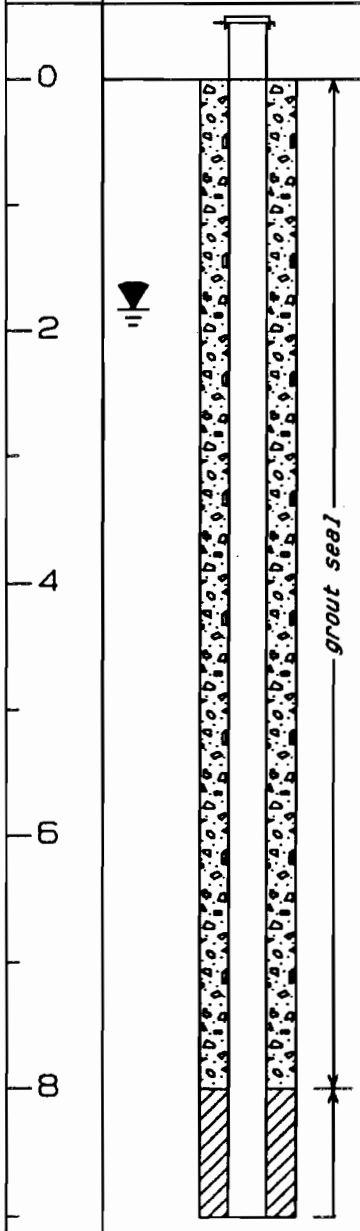


0-2'	Silt with slag pellets, moist, brown (5YR3/4).
2-4'	2-2.3' silt and slag, caving, wet, brown (5YR3/4). 2.3-2.9' gravel and sand fill, gravel 1/2" diameter, medium grained, sand 40%, brown (10YR6/6). 2.9-3.4' silt and gravel, moist, brown (10YR4/2).
4-6'	4-4.4' caving, slag pellets. 4.4-5.1' silt and gravel as above, lumber, wet, brown (10YR4/2).
6-8'	6-6.5' sand, medium to coarse grained, fragments of brick, small quartz pebbles, fairly well sorted, gray brown (5YR4/1). 6.5-7.5' slag pellets, wet. 7.5-8' sand, medium grained, well sorted, stained black at 8', wet, gray brown (10YR4/2).

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

Well Number MW-15L
Coordinates E693135.12, N697843.83
Top of Casing Elevation 6.4 feet
Groundsurface Elevation 3.9 feet
Total Borehole Depth 16 feet
Total Well Depth 16 feet
Date Started 12/6/90
Date Well Completed 12/6/90



DESCRIPTION

0-2' 0-2' black and gray asphalt material.

2-4' 2-2.3' silt, dark gray.
2.3-2.7' brick.
2.7-3.5' black silt and limestone fragment fill.
3.5-3.75' lumber.

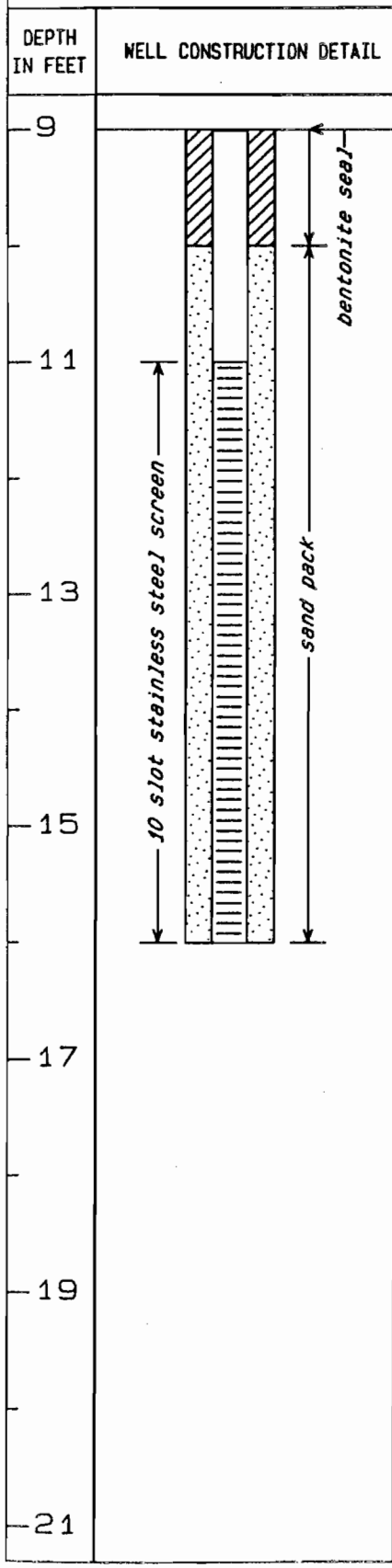
4-6' 4-5' no sample.
5-6' fill, dark brown silt and gray sandy material with large flakes of mica; possible meadow mat in nose of spoon.

6-8' Some mica and meadow mat.

8-10' Meadow mat, fine grained sand in nose of spoon, very soft material, sand is brown gray (5YR3/2)

OVERBURDEN WELL

PROJECT STANDARD CHLORINE WELL NUMBER MW-15L



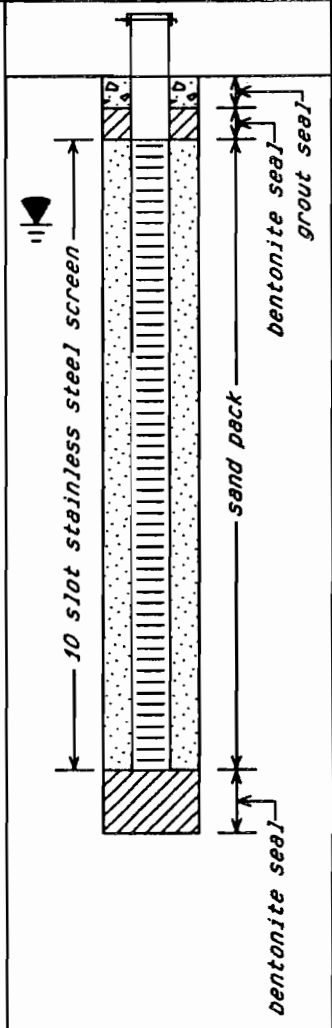
10-12'	10-10.25' meadow mat, caving. 10.25-10.75' fine grained to very fine grained sand with pieces of meadow mat, brown gray (5YR4/1), clay is 30-35%. 10.75-11.3' fine grained sand, no clay (5YR4/1).
12-14'	12-12.25' caving. 12.25-13.25' sand, fine grained, brown-gray (5YR4/1).
14-16'	14-15.25' sand, brown gray (5YR4/1), medium to coarse, well sorted, wet 15.25-15.5' clay, brown-gray, stiff, oozing, brown-blue, liquid.

(Page 1 of 1)

OVERBURDEN WELL

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist Celia Greenman
Drilling Contractor J.C. Anderson
Driller Jon Urban
Drilling Method Hollow stem auger
Diameter of Borehole 12 inches
Diameter of Well Casing 4 inches

Well Number MW-15U
Coordinates E603138.76, N697842.67
Top of Casing Elevation 6.44 feet
Groundsurface Elevation 3.85 feet
Total Borehole Depth 6 feet
Total Well Depth 6 feet
Date Started 12/6/90
Date Well Completed 12/6/90



DEPTH IN FEET	SAMPLE INTERVAL	BLOW COUNT	RECOVERY	GRAPHIC SYMBOL	HNU/OVA READING	DESCRIPTION
0						0-2' 0-2' black and gray asphalt material.
2						2-4' 2-2.3' silt, dark gray. 2.3-2.7' brick. 2.7-3.5' black silt and limestone fragment fill. 3.5-3.75' lumber.
4						4-6' 4-5' no sample. 5-6' fill, dark brown silt and gray sandy material with large flakes of mica possible meadow mat in nose of spoon.
6						6-8' Some mica and meadow mat.
8						

BORING LOG

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist W. Brew
Drilling Contractor J.C. Anderson
Driller J. Burrell
Drilling Method Hollow stem auger
Diameter of Borehole 6 inches

Boring Number SB-1
Total Borehole Depth 4 feet
Date Started 10/7/92
Date Boring Completed 10/7/92

DEPTH IN FEET	LAB SAMPLE	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READINGS	DESCRIPTION
0					XXXX		0-1' Augered.
			13-15	60	XXXX		1-2' Black bituminus fill material. 2-2.8' Red brick, broken
2			15-18		XXXX		
			50/1'	0	XXXX		3-4' No recovery.
4					XXXX		
6							
8							
10							
12							

BORING LOG

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist W. Brew
Drilling Contractor J.C. Anderson
Driller J. Burrell
Drilling Method Hollow stem auger
Diameter of Borehole 6 inches

Boring Number SB-2
Total Borehole Depth 17 feet
Date Started 10/7/92
Date Boring Completed 10/7/92

DEPTH IN FEET	LAB SAMPLE	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READINGS	DESCRIPTION
0							0-1' Augered.
			5-10	70			1-2.4' Black bituminus type fill, silty, pieces of brick damp.
2			15-16				
			11-13	50			3-4' Same as above with wood, wet at 4.8'
4			15-11				
			4-5	35			5-6.7' Same as above. 6.7' Green gray f to m SAND, trace f gravel
6			8-4				
			1-1	40			8.3' Marsh mat, brown peat, moist.
8			1-1				
			1-2	25			9' Same as above.
10			1-1				
			4-4	80			11-12.6' Green gray f sand w/silt, wet. 12.6-12.8' Green gray CLAY
12							

BORING LOG

PROJECT STANDARD CHLORINE BORING NUMBER SB-2

DEPTH IN FEET	LAB SAMPLE	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READINGS	DESCRIPTION
12			5-7	80			Same as 11-12.6' above.
			2-2	30			
14			5-9				
			2-4	100			15-16.2' Same as above, more m SAND, product.
16			4-5				16.2' Green gray CLAY
18							
20							
22							
24							
26							
28							

BORING LOG

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist W. Brew
Drilling Contractor J.C. Anderson
Driller J. Burrell
Drilling Method Hollow stem auger
Diameter of Borehole 6 inches

Boring Number SB-3
Total Borehole Depth 17 feet
Date Started 10/6/92
Date Boring Completed 10/6/92

DEPTH IN FEET	LAB SAMPLE	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READINGS	DESCRIPTION
0							0-1' 0-8" asphalt 8-10" membrane 10" coarse gravel
			3-4	15			Black-red fill, silt w/ clay and gravel, wet.
2			5-7				
			5-6	50			Dark red c sand, fill, wet, with silt, cobble at end of spoon.
4			7-6				
			6-8				Same as above to 6.8'. 6.8' Same color change to black, stained.
6			13-13				
			15-5	20			Marsh mat at 8.8' peaty, moist.
8			1-2				
			1-2	45			10.6' Green gray f SAND, end of spoon green gray CLAY.
10			4-5				
			3-6	0			No recovery.
12							

BORING LOG

PROJECT STANDARD CHLORINE BORING NUMBER SB-3

DEPTH IN FEET	LAB SAMPLE	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READINGS	DESCRIPTION
12				0			
			4-5	60			Black red CLAY at 14.5'.
14			7-6				
			5-7	100			Green gray f grained SAND with silt to 16.9'
16			10-9				Green gray CLAY at 17'.
18							
20							
22							
24							
26							
28							

BORING LOG

Project STANDARD CHLORINE
Location KEARNY, NJ
Geologist W. Brew
Drilling Contractor J.C. Anderson
Driller J. Burrell
Drilling Method Hollow stem auger
Diameter of Borehole 6 inches

Boring Number SB-4
Total Borehole Depth 17 feet
Date Started 10/6/92
Date Boring Completed 10/6/92

DEPTH IN FEET	LAB SAMPLE	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READINGS	DESCRIPTION
0							Augered
2			8-10 12-7	60			Brown f to m SAND w/trace silt, stained black, wet. 2" layer of silty clay (2.6-2.8')
4			2-6 6-6	20			Fill, gray green c SAND and silt w/trace f gravel, damp.
6			2-1 1-1	30			Same as above to 6.7'. 6.7' Marsh mat, peat, damp.
8			1-1 1-1	0			No recovery.
10			1-2 2-4	45			10.2' Black gray f SAND and silt, saturated.
12			4-9	100			Same as above to 11.3' 11.3-12.3' Black green silty CLAY, damp. 12.3 Brown f SAND w/some m SAND and trace silt, saturated.

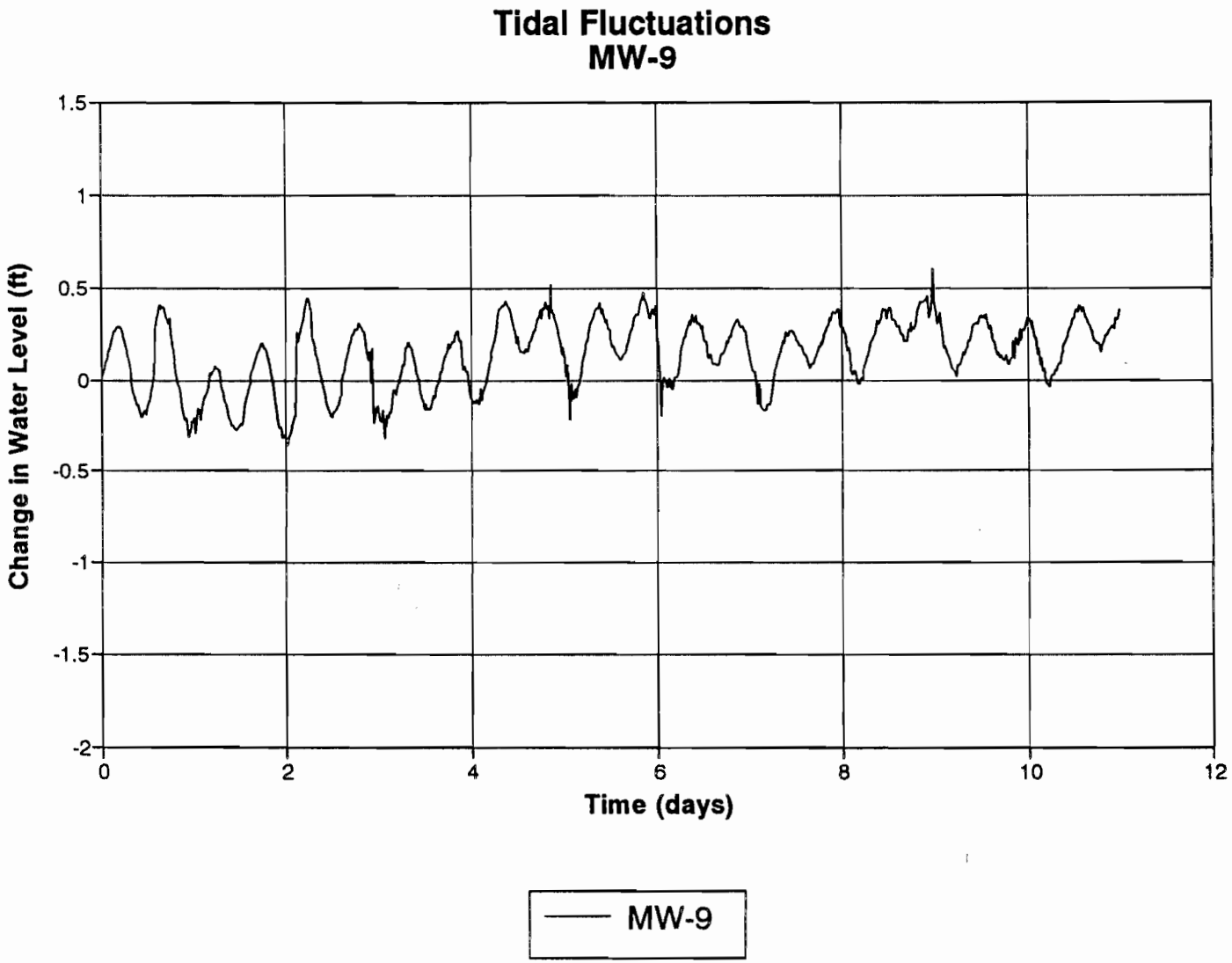
BORING LOG

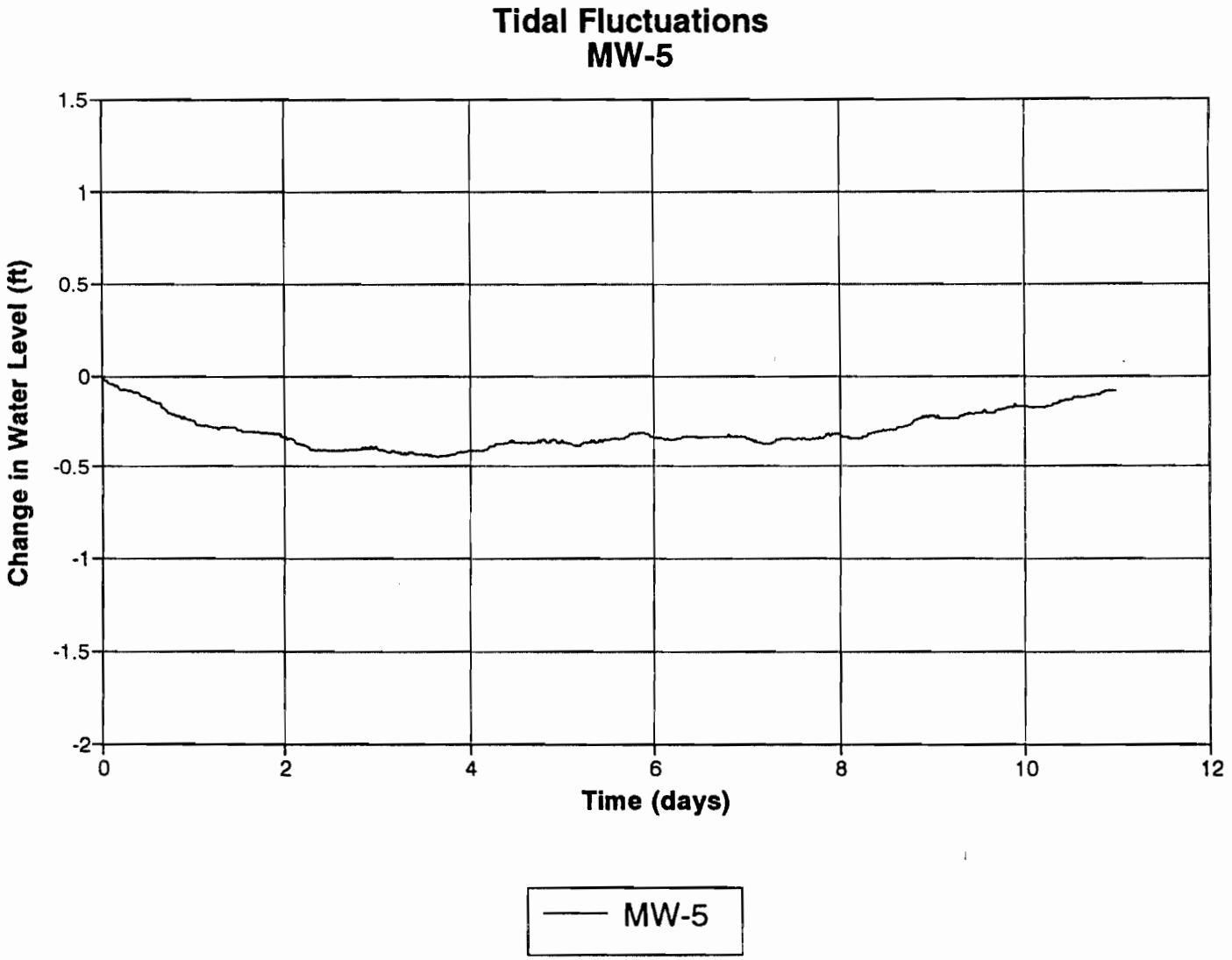
PROJECT STANDARD CHLORINE BORING NUMBER SB-4

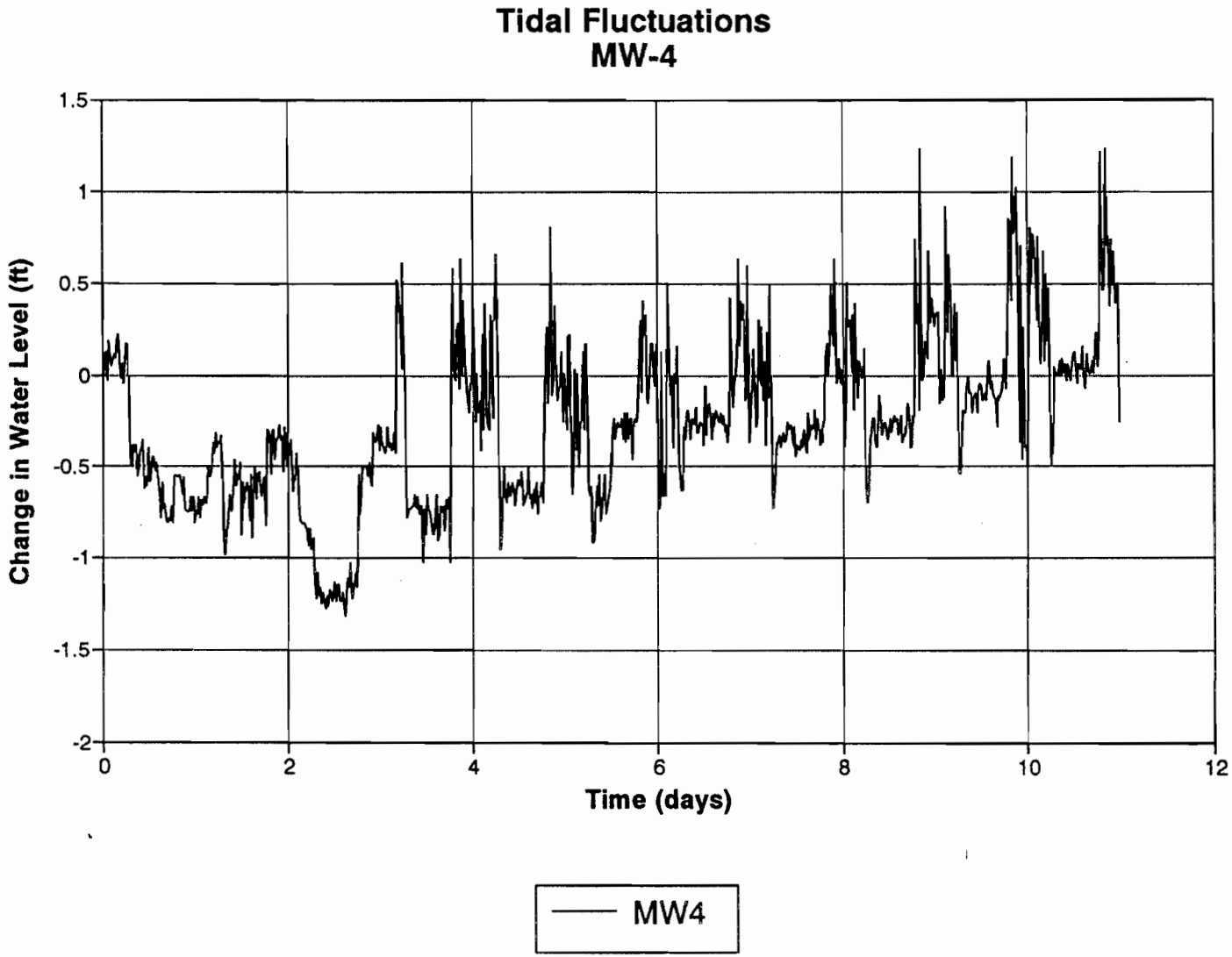
DEPTH IN FEET	LAB SAMPLE	SAMPLE INTERVAL	BLOW COUNT	% RECOVERY	GRAPHIC SYMBOL	HNU/OVA READINGS	DESCRIPTION
12							
			16-13	100			Same as 12.3' above.
			6-5	100			
14			8-10				
			5-6	80			Same as above to 15.3'. 15.3' Brown gray CLAY with silt, wet.
16			7-5				
18							
20							
22							
24							
26							
28							

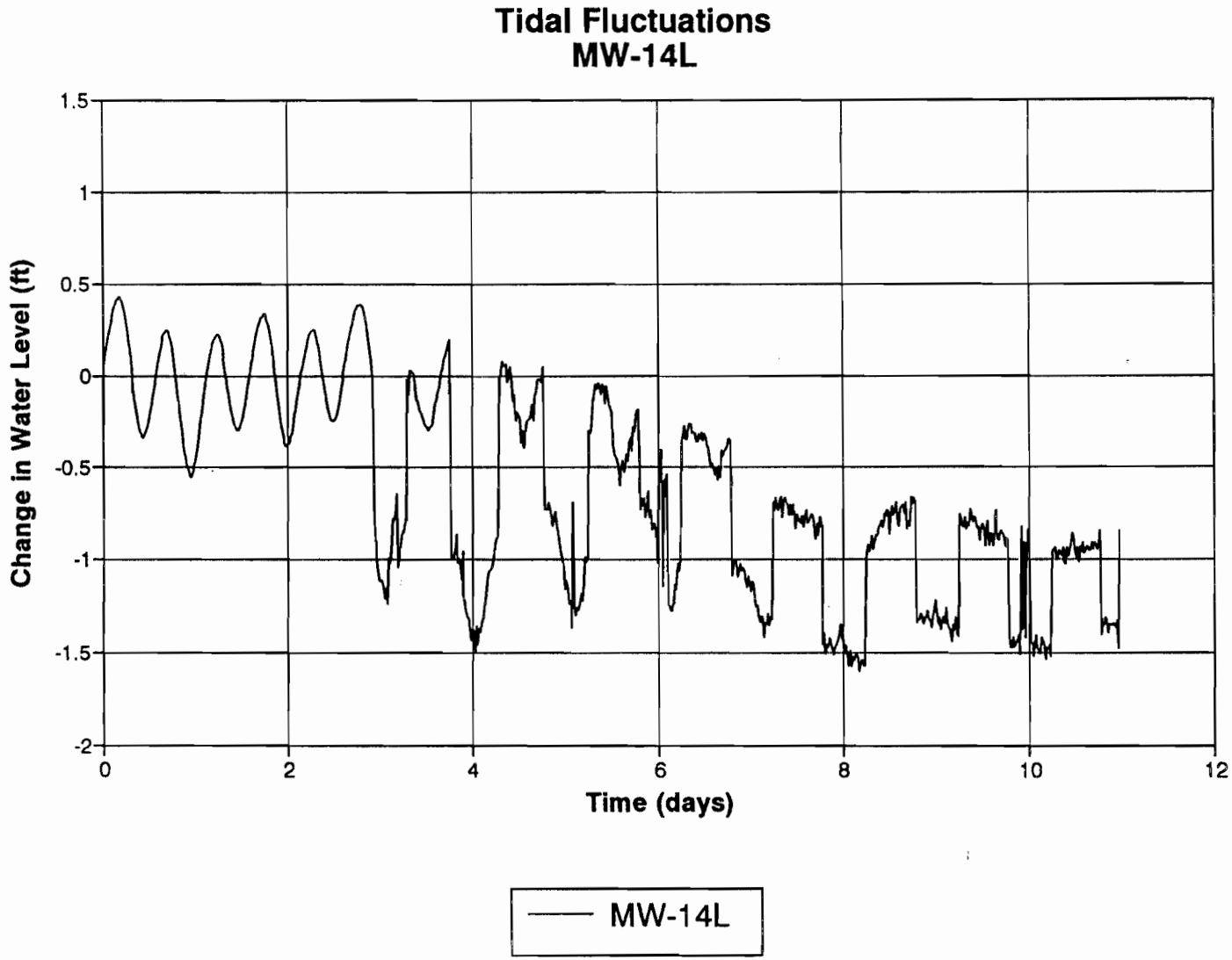
APPENDIX C

TIDAL GRAPHS AND SLUG TEST RESULTS


Tidal Fluctuations
MW-9
Change in Water Level (ft)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
2
4
6
8
10
12
Time (days)
MW-9


Tidal Fluctuations
MW-5
Change in Water Level (ft)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
2
4
6
8
10
12
Time (days)
MW-5


Tidal Fluctuations
MW-4
Change in Water Level (ft)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
2
4
6
8
10
12
Time (days)
MW4


Tidal Fluctuations
MW-14L
Change in Water Level (ft)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
0
2
4
6
8
10
12
Time (days)
MW-14L

SLUG TEST ANALYSIS

STANDARD CHLORINE, NEW JERSEY

MW-3

Falling Head

Well Specifications

Total well depth:	18 feet	Well diameter:	4 inches
Depth to water:	3.47 feet	Borehole diameter:	12 inches
Screen length (Le):	5 feet	Sat. thickness (Lw):	14.53 feet
Aquifer thickness:	14.54 feet	Sandpack porosity:	0.15
Rc=	0.25 feet	rw=	0.5000 feet
From type curve:			
Where Le/rw=	10	A=	2
	ln(Re/rw)= 2.3328	B=	0.25

Results

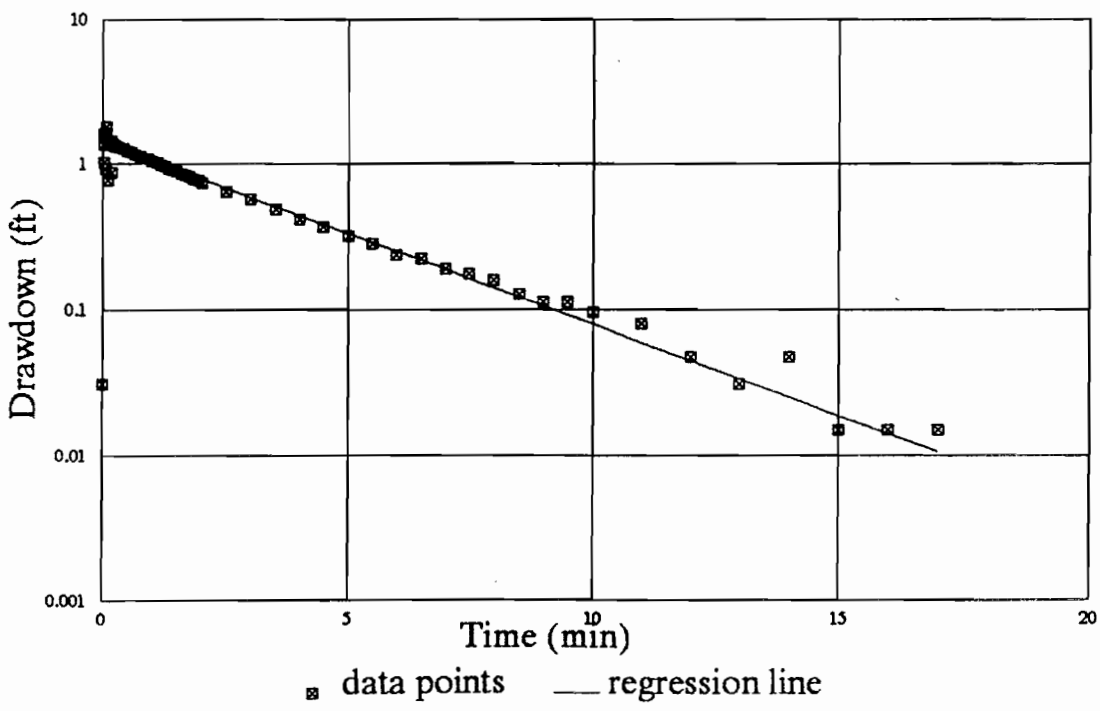
Bouwer and Rice Method

Regression line: r squared = 0.9963

Hydraulic conductivity = 5.88 ft/day

Effective radial distance of slug test = 5.2 feet

Graphical Results



SLUG TEST ANALYSIS
STANDARD CHLORINE, NEW JERSEY
MW-03
RISING HEAD

Well Specifications

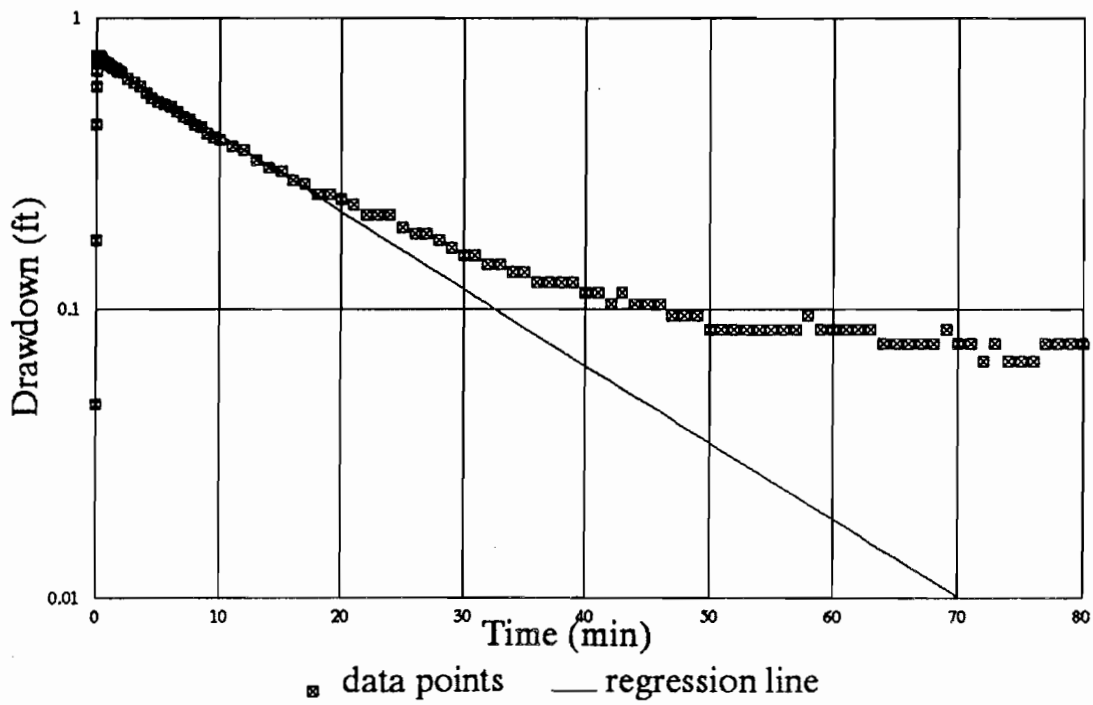
Total well depth:	18	feet	Well diameter:	4	inches
Depth to water:	3.47	feet	Borehole diameter:	12	inches
Screen length (Le):	5	feet	Sat. thickness (Lw):	14.53	feet
Aquifer thickness:	14.54	feet	Sandpack porosity:	0.15	
Rc=	0.25	feet	rw=	0.5000	feet
From type curve:					
Where Le/rw=	10		A=	2	
	ln(Re/rw)=	2.3328	B=	0.25	

Results

Bouwer and Rice Method

Regression line: r squared =	0.9933
Hydraulic conductivity =	1.25 ft/day
Effective radial distance of slug test =	5.2 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE, NEW JERSEY

MW-4

Falling Head

Well Specifications

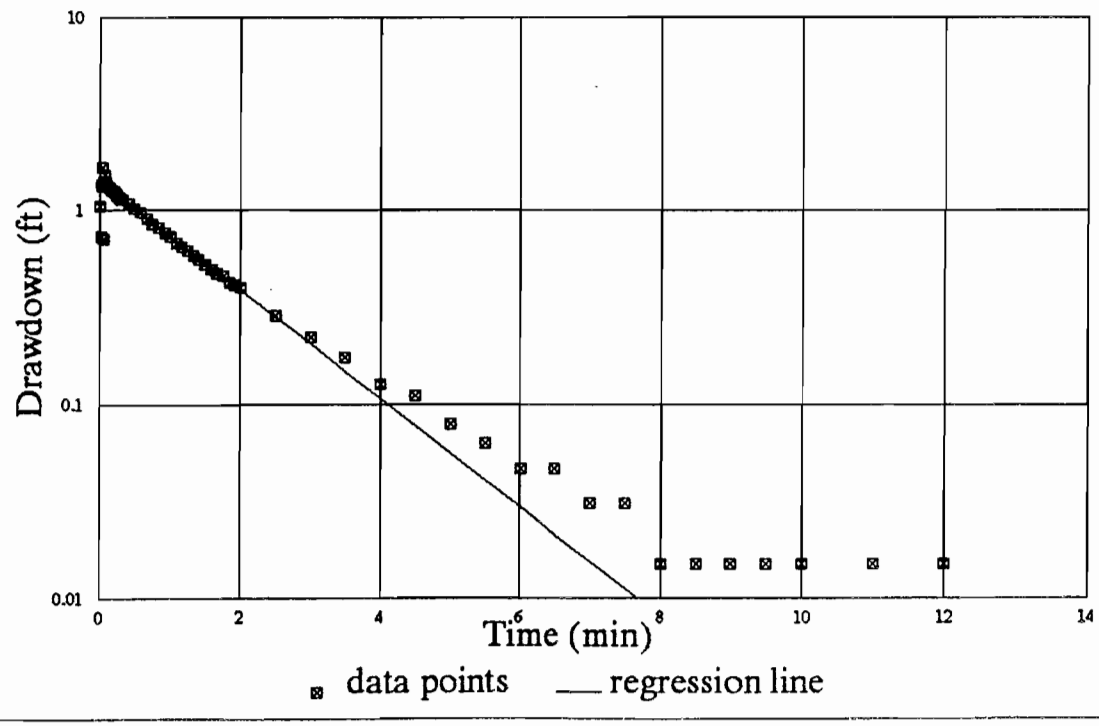
Total well depth:	18	feet	Well diameter:	4	inches
Depth to water:	5.88	feet	Borehole diameter:	12	inches
Screen length (Le):	5	feet	Sat. thickness (Lw):	12.12	feet
Aquifer thickness:	12.13	feet	Sandpack porosity:	0.15	
Rc=	0.25	feet	rw=	0.5000	feet
From type curve:					
Where Le/rw=	10		A=	2	
	ln(Re/rw)=	2.2359	B=	0.25	

Results

Bouwer and Rice Method

Regression line: r squared =	0.9979
Hydraulic conductivity =	12.63 ft/day
Effective radial distance of slug test =	4.7 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE, NEW JERSEY

MW-4

Rising Head

Well Specifications

Total well depth:	18 feet	Well diameter:	4 inches
Depth to water:	5.88 feet	Borehole diameter:	12 inches
Screen length (Le):	5 feet	Sat. thickness (Lw):	12.12 feet
Aquifer thickness:	12.13 feet	Sandpack porosity:	0.15
Rc=	0.25 feet	rw=	0.5000 feet
From type curve:			
Where Le/rw=	10	A=	2
ln(Re/rw)=	2.2359	B=	0.25

Results

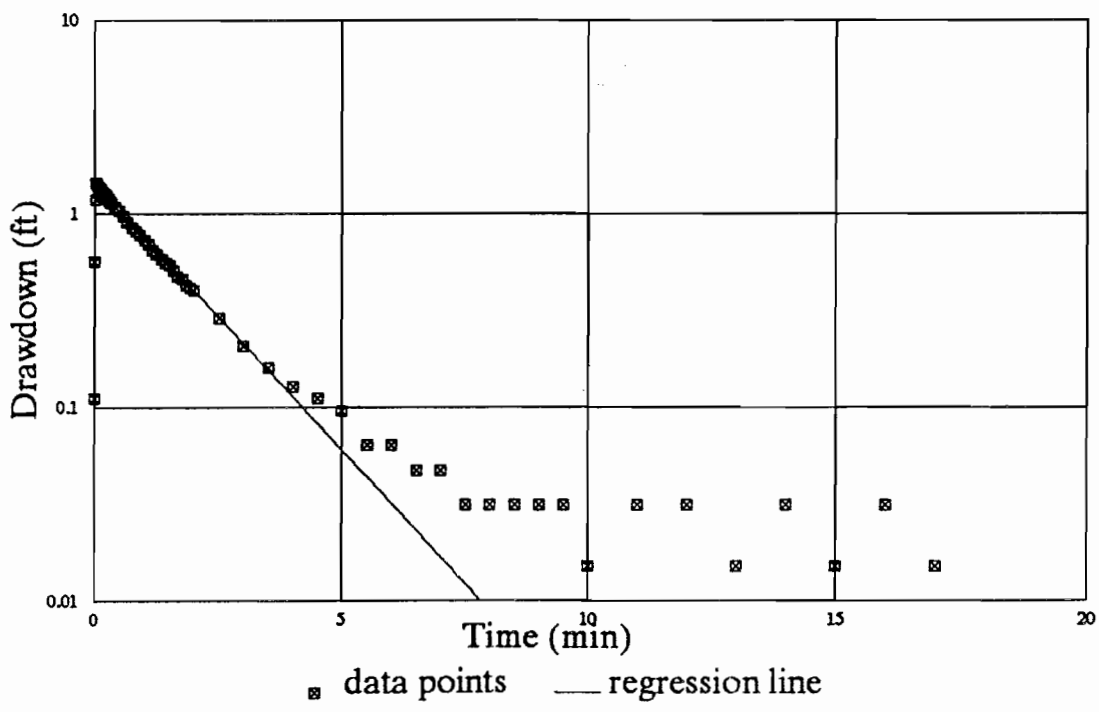
Bouwer and Rice Method

Regression line: r squared = 0.9977

Hydraulic conductivity = 12.40 ft/day

Effective radial distance of slug test = 4.7 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE, NEW JERSEY

MW-5

Falling Head

Well Specifications

Total well depth:	17	feet	Well diameter:	4	inches
Depth to water:	3.9	feet	Borehole diameter:	12	inches
Screen length (Le):	5	feet	Sat. thickness (Lw):	13.1	feet
Aquifer thickness:	13.11	feet	Sandpack porosity:	0.15	
Rc=	0.25	feet	rw=	0.5000	feet
From type curve:					
Where Le/rw=	10		A=	2	
	ln(Re/rw)=	2.2778	B=	0.25	

Results

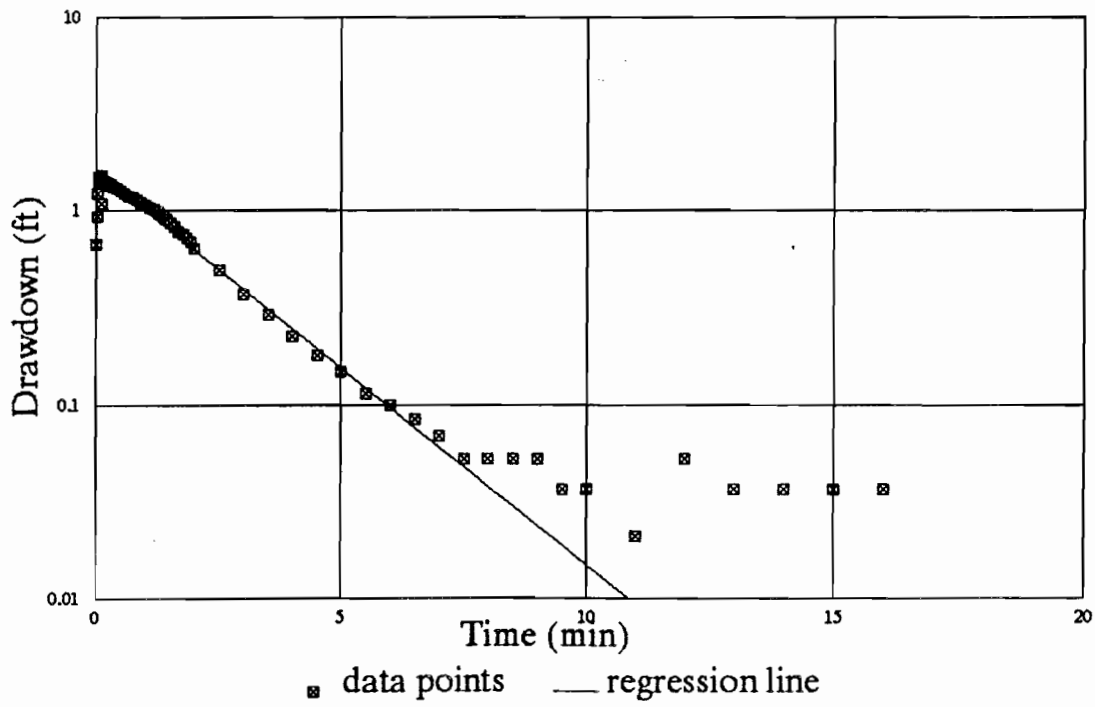
Bouwer and Rice Method

Regression line: r squared = 0.9887

Hydraulic conductivity = 9.33 ft/day

Effective radial distance of slug test = 4.9 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE, NEW JERSEY

MW-5

Rising Head

Well Specifications

Total well depth:	17	feet	Well diameter:	4	inches
Depth to water:	3.9	feet	Borehole diameter:	12	inches
Screen length (Le):	5	feet	Sat. thickness (Lw):	13.1	feet
Aquifer thickness:	13.11	feet	Sandpack porosity:	0.15	
Rc=	0.25	feet	rw=	0.5000	feet
From type curve:					
Where Le/rw=	10		A=	2	
	ln(Re/rw)=	2.2778	B=	0.25	

Results

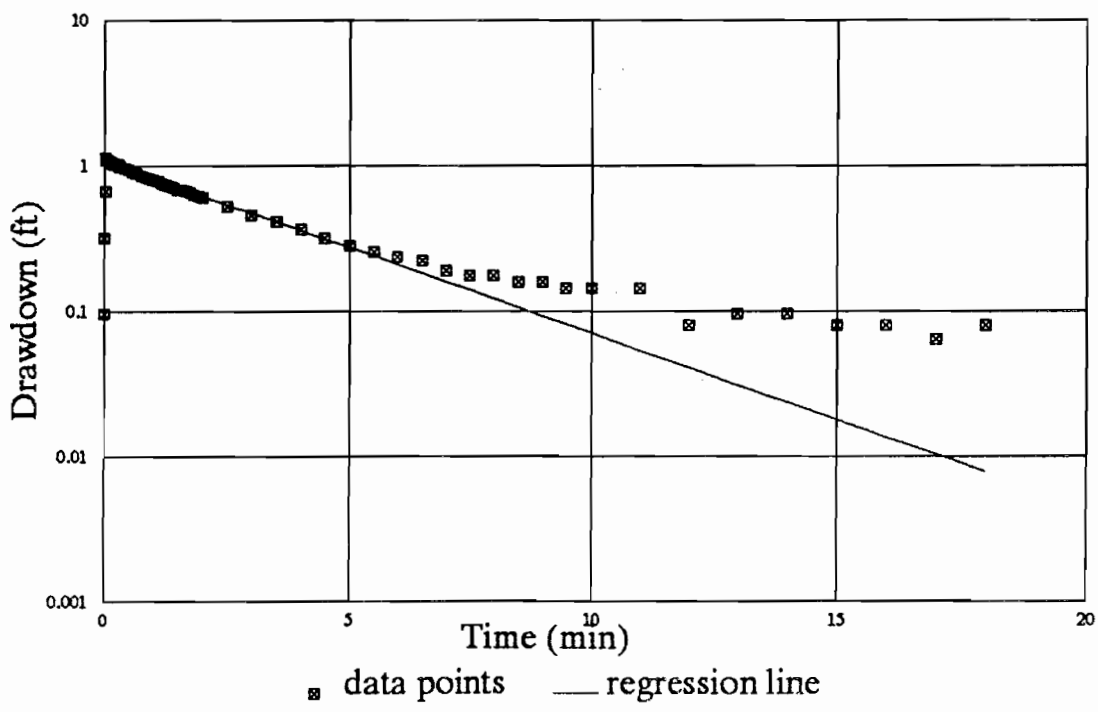
Bouwer and Rice Method

Regression line: r squared = 0.9963

Hydraulic conductivity = 5.45 ft/day

Effective radial distance of slug test = 4.9 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE, NEW JERSEY

MW-6

Falling Head

Well Specifications

Total well depth:	16 feet	Well diameter:	4 inches
Depth to water:	4.1 feet	Borehole diameter:	12 inches
Screen length (Le):	5 feet	Sat. thickness (Lw):	11.9 feet
Aquifer thickness:	11.91 feet	Sandpack porosity:	0.15
Rc=	0.25 feet	rw=	0.5000 feet
From type curve:			
Where Le/rw=	10	A=	2
	ln(Re/rw)= 2.2260	B=	0.25

Results

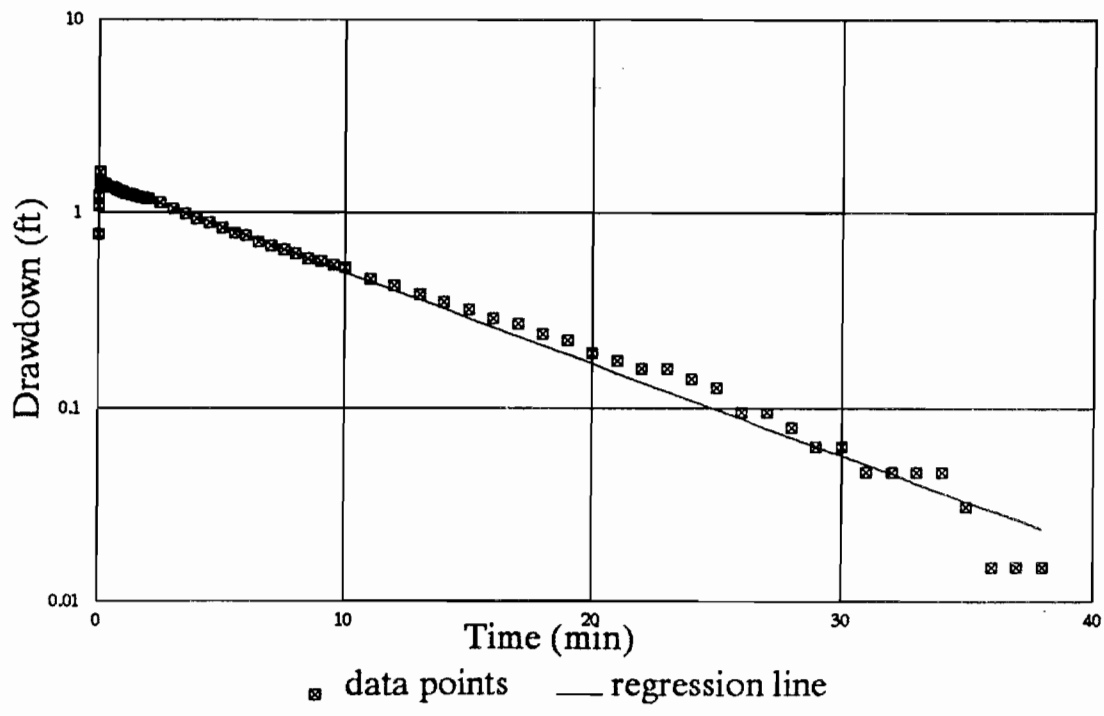
Bouwer and Rice Method

Regression line: r squared = 0.9877

Hydraulic conductivity = 2.12 ft/day

Effective radial distance of slug test = 4.6 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE, NEW JERSEY

MW-6

Rising Head

Well Specifications

Total well depth:	16 feet	Well diameter:	4 inches
Depth to water:	4.1 feet	Borehole diameter:	12 inches
Screen length (Le):	5 feet	Sat. thickness (Lw):	11.9 feet
Aquifer thickness:	11.91 feet	Sandpack porosity:	
Rc=	0.25 feet	rw=	0.5000 feet
From type curve:			
Where Le/rw=	10	A=	2
	ln(Re/rw)= 2.2260	B=	0.25

Results

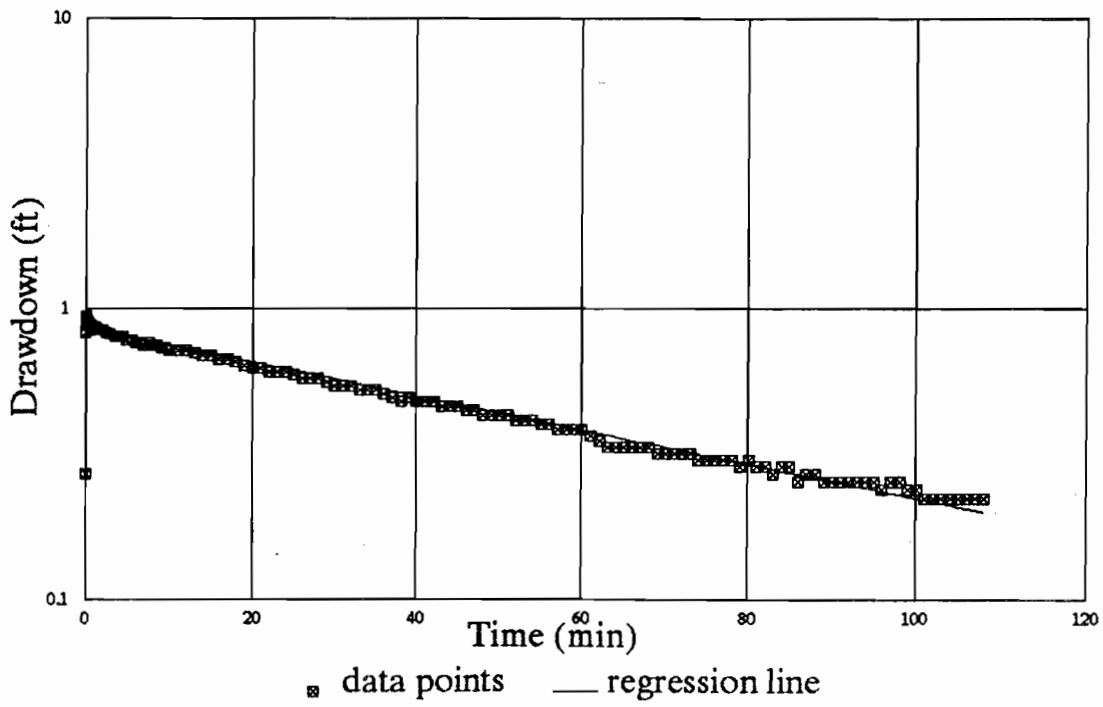
Bouwer and Rice Method

Regression line: r squared = 0.9920

Hydraulic conductivity = 0.26 ft/day

Effective radial distance of slug test = 4.6 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE, NEW JERSEY

MW-8

Falling Head

Well Specifications

Total well depth:	19	feet	Well diameter:	4	inches
Depth to water:	7.52	feet	Borehole diameter:	12	inches
Screen length (Le):	5	feet	Sat. thickness (Lw):	11.48	feet
Aquifer thickness:	11.49	feet	Sandpack porosity:	0.15	
Rc=	0.25	feet	rw=	0.5000	feet
From type curve:					
Where Le/rw=	10		A=	2	
	ln(Re/rw)=	2.2065	B=	0.25	

Results

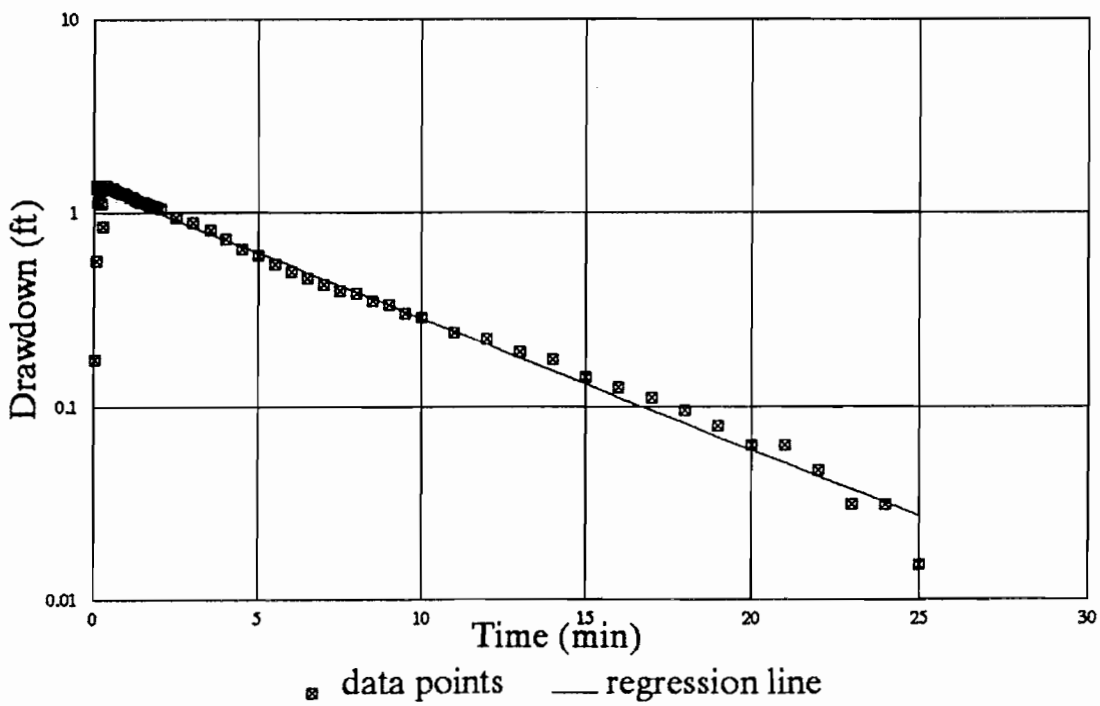
Bouwer and Rice Method

Regression line: r squared = 0.9817

Hydraulic conductivity = 3.02 ft/day

Effective radial distance of slug test = 4.5 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE, NEW JERSEY

MW-8

Rising Head

Well Specifications

Total well depth:	19 feet	Well diameter:	4 inches
Depth to water:	7.52 feet	Borehole diameter:	12 inches
Screen length (Le):	5 feet	Sat. thickness (Lw):	11.48 feet
Aquifer thickness:	11.49 feet	Sandpack porosity:	0.15
Rc=	0.25 feet	rw=	0.5000 feet
From type curve:			
Where Le/rw=	10	A=	2
ln(Re/rw)=	2.2065	B=	0.25

Results

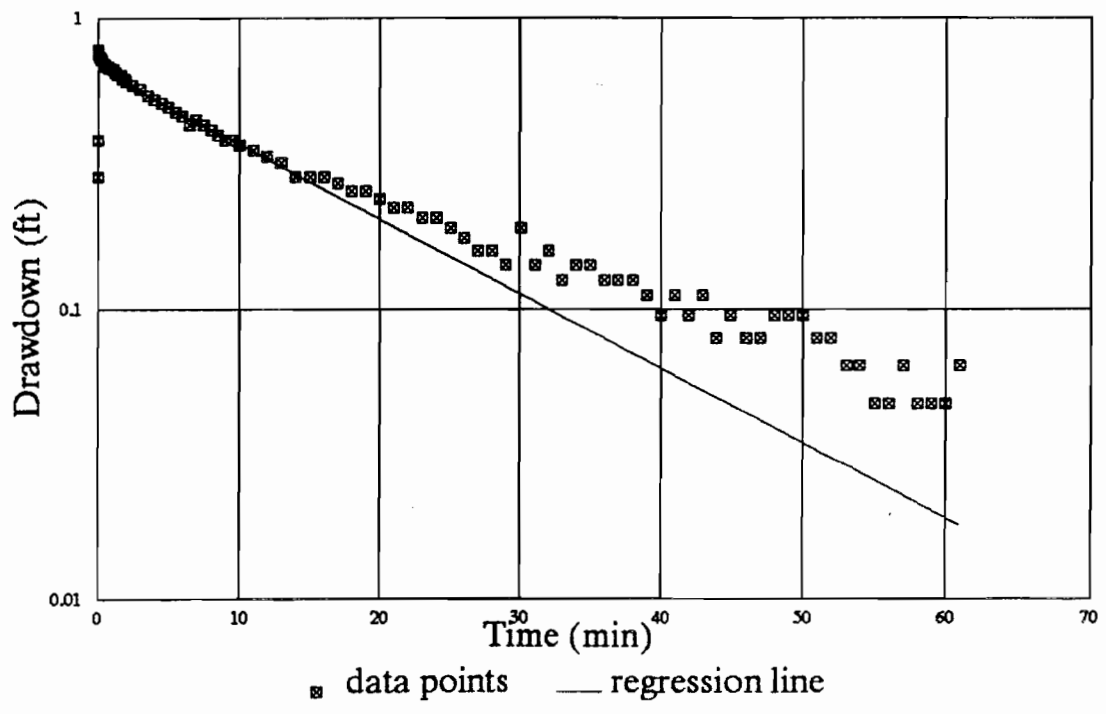
Bouwer and Rice Method

Regression line: r squared = 0.9893

Hydraulic conductivity = 1.15 ft/day

Effective radial distance of slug test = 4.5 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE,NEW JERSEY

MW-9

Falling Head

Well Specifications

Total well depth:	21 feet	Well diameter:	4 inches
Depth to water:	9.47 feet	Borehole diameter:	12 inches
Screen length (Le):	5 feet	Sat. thickness (Lw):	11.53 feet
Aquifer thickness:	11.54 feet	Sandpack porosity:	0.15
Rc=	0.25 feet	rw=	0.5000 feet
From type curve:			
Where Le/rw=	10	A=	2
ln(Re/rw)=	2.2088	B=	0.25

Results

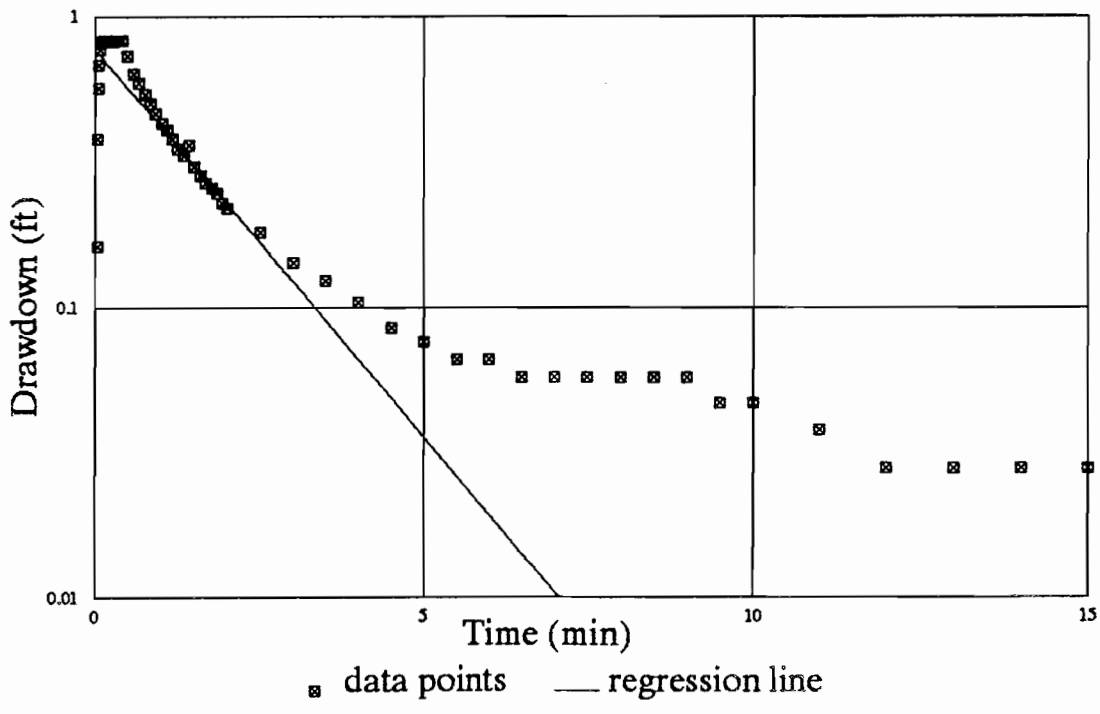
Bouwer and Rice Method

Regression line: r squared = 0.9681

Hydraulic conductivity = 11.93 ft/day

Effective radial distance of slug test = 4.6 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE, NEW JERSEY

MW-9

Rising Head

Well Specifications

Total well depth:	21 feet	Well diameter:	4 inches
Depth to water:	9.47 feet	Borehole diameter:	12 inches
Screen length (Le):	5 feet	Sat. thickness (Lw):	11.53 feet
Aquifer thickness:	11.54 feet	Sandpack porosity:	0.15
Rc=	0.25 feet	rw=	0.5000 feet
From type curve:			
Where Le/rw=	10	A=	2
ln(Re/rw)=	2.2088	B=	0.25

Results

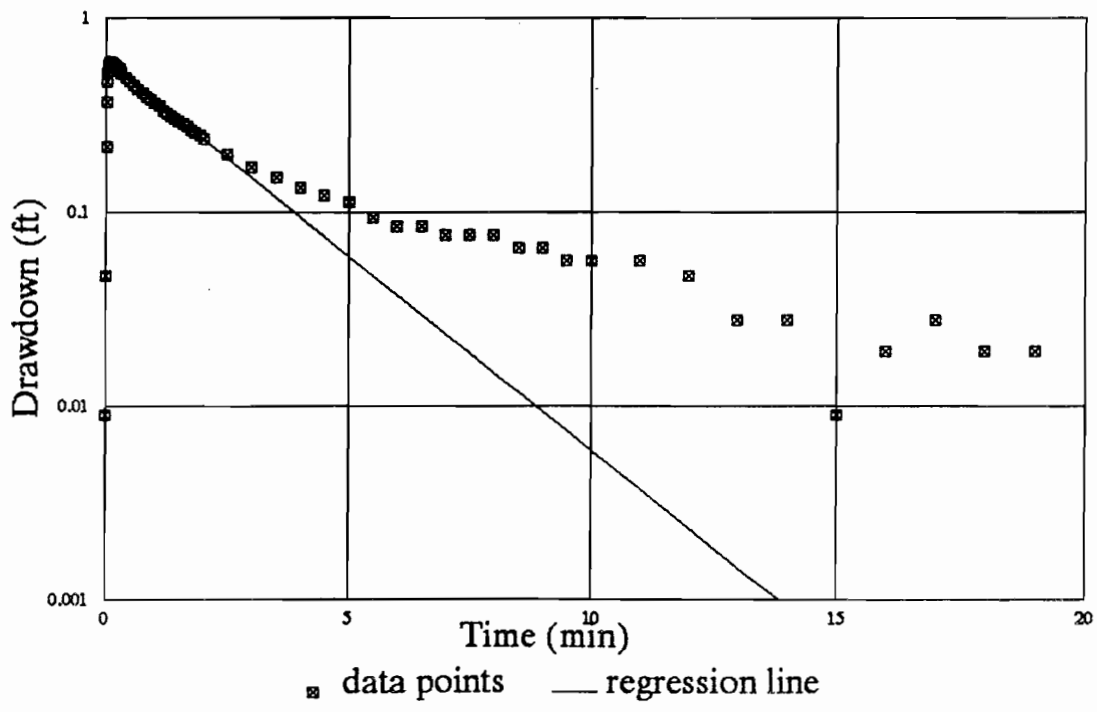
Bouwer and Rice Method

Regression line: r squared = 0.9885

Hydraulic conductivity = 8.97 ft/day

Effective radial distance of slug test = 4.6 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE, NEW JERSEY

MW-13

Falling Head

Well Specifications

Total well depth:	22.5 feet	Well diameter:	4 inches
Depth to water:	10.03 feet	Borehole diameter:	12 inches
Screen length (Le):	5 feet	Sat. thickness (Lw):	12.47 feet
Aquifer thickness:	12.48 feet	Sandpack porosity:	0.15
Rc=	0.25 feet	rw=	0.5000 feet
From type curve:			
Where Le/rw=	10	A=	2
	ln(Re/rw)= 2.2513	B=	0.25

Results

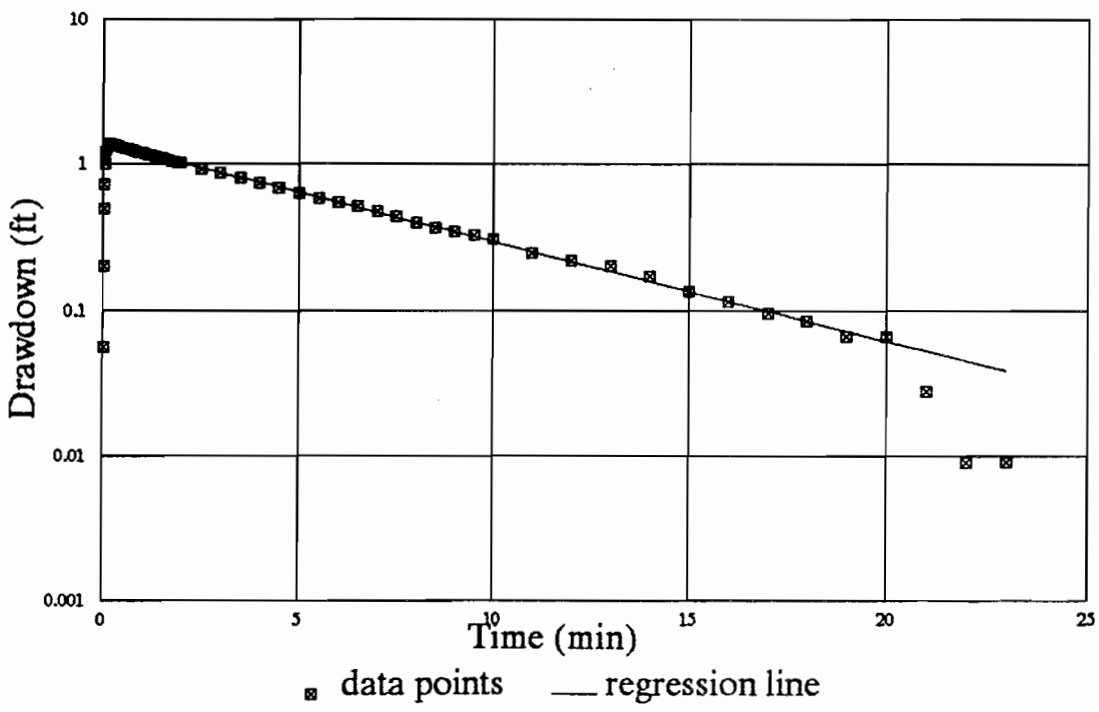
Bouwer and Rice Method

Regression line: r squared = 0.9995

Hydraulic conductivity = 3.09 ft/day

Effective radial distance of slug test = 4.8 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE, NEW JERSEY

MW-13

Rising Head

Well Specifications

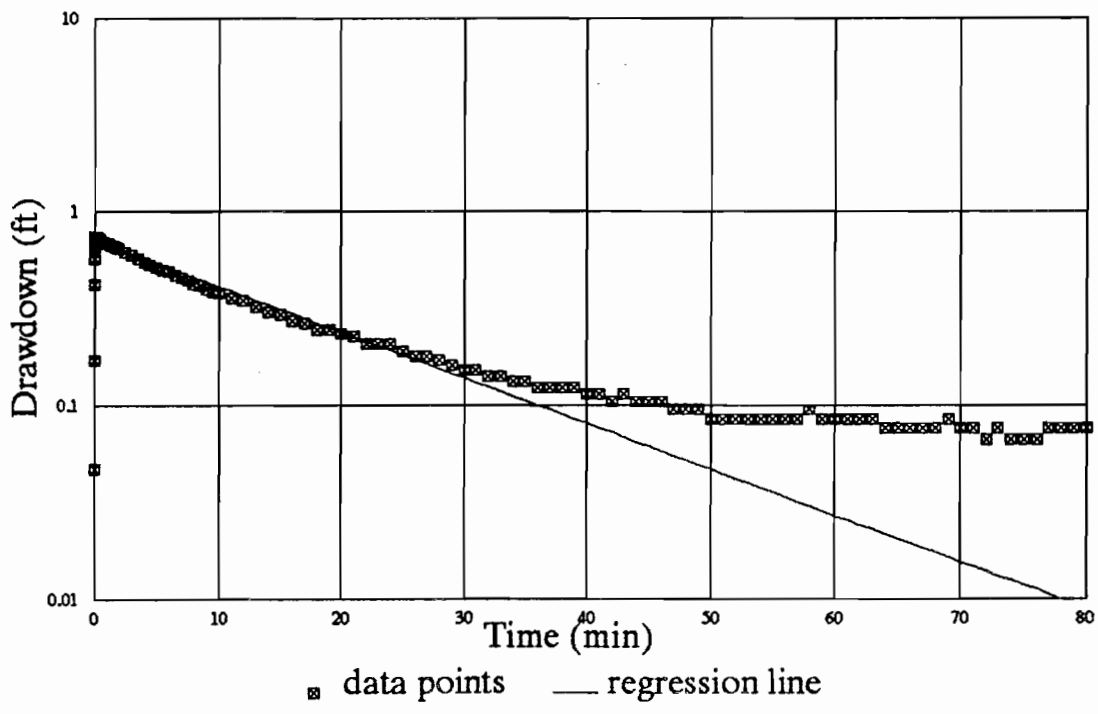
Total well depth:	22.5	feet	Well diameter:	4	inches
Depth to water:	10.03	feet	Borehole diameter:	12	inches
Screen length (Le):	5	feet	Sat. thickness (Lw):	12.47	feet
Aquifer thickness:	12.48	feet	Sandpack porosity:	0.15	
Rc=	0.25	feet	rw=	0.5000	feet
From type curve:					
Where Le/rw=	10		A=	2	
	ln(Re/rw)=	2.2513	B=	0.25	

Results

Bouwer and Rice Method

Regression line: r squared =	0.9894
Hydraulic conductivity =	1.08 ft/day
Effective radial distance of slug test =	4.8 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE, NEW JERSEY

MW-14

Falling Head

Well Specifications

Total well depth:	18 feet	Well diameter:	4 inches
Depth to water:	6.37 feet	Borehole diameter:	12 inches
Screen length (Le):	5 feet	Sat. thickness (Lw):	11.63 feet
Aquifer thickness:	11.64 feet	Sandpack porosity:	0.15
Rc=	0.25 feet	rw=	0.5000 feet
From type curve:			
Where Le/rw=	10	A=	2
ln(Re/rw)=	2.2135	B=	0.25

Results

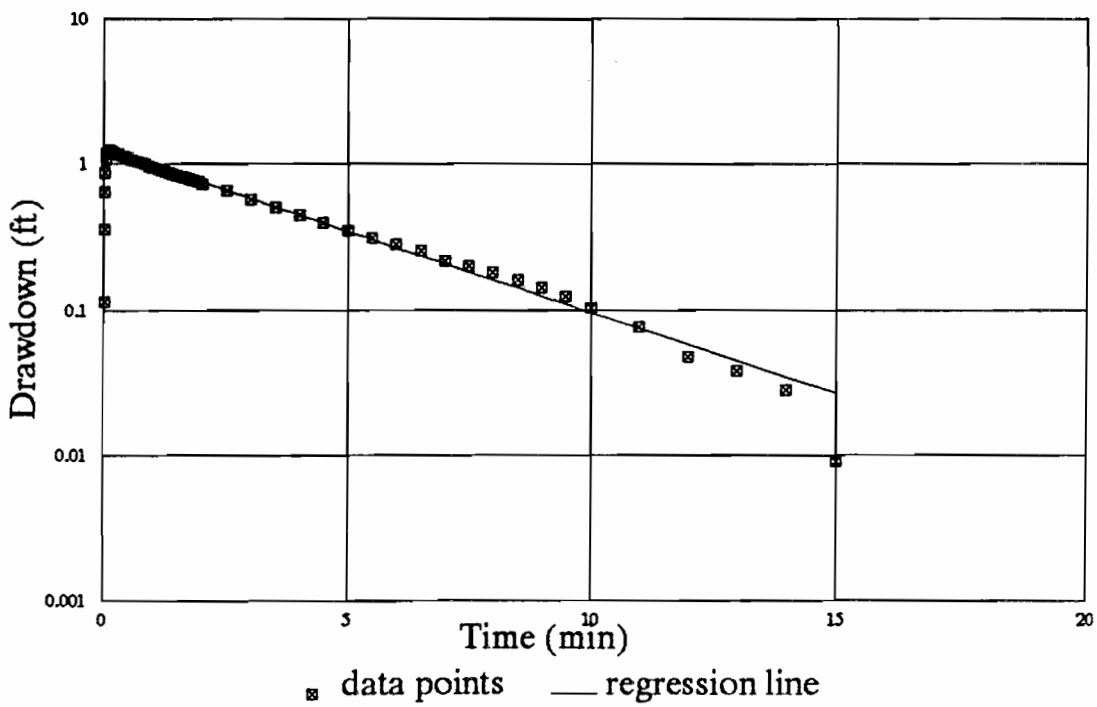
Bouwer and Rice Method

Regression line: r squared = 0.9971

Hydraulic conductivity = 4.99 ft/day

Effective radial distance of slug test = 4.6 feet

Graphical Results



SLUG TEST ANALYSIS

STANDARD CHLORINE,NEW JERSEY

MW–14

Rising Head

Well Specifications

Total well depth:	18 feet	Well diameter:	4 inches
Depth to water:	6.37 feet	Borehole diameter:	12 inches
Screen length (Le):	5 feet	Sat. thickness (Lw):	11.63 feet
Aquifer thickness:	11.64 feet	Sandpack porosity:	0.15
Rc=	0.25 feet	rw=	0.5000 feet
From type curve:			
Where Le/rw=	10	A=	2
ln(Re/rw)=	2.2135	B=	0.25

Results

Bouwer and Rice Method

Regression line: r squared = 0.9882

Hydraulic conductivity = 1.89 ft/day

Effective radial distance of slug test = 4.6 feet

Graphical Results